NEW ZEALAND JOURNAL OF Agriculture

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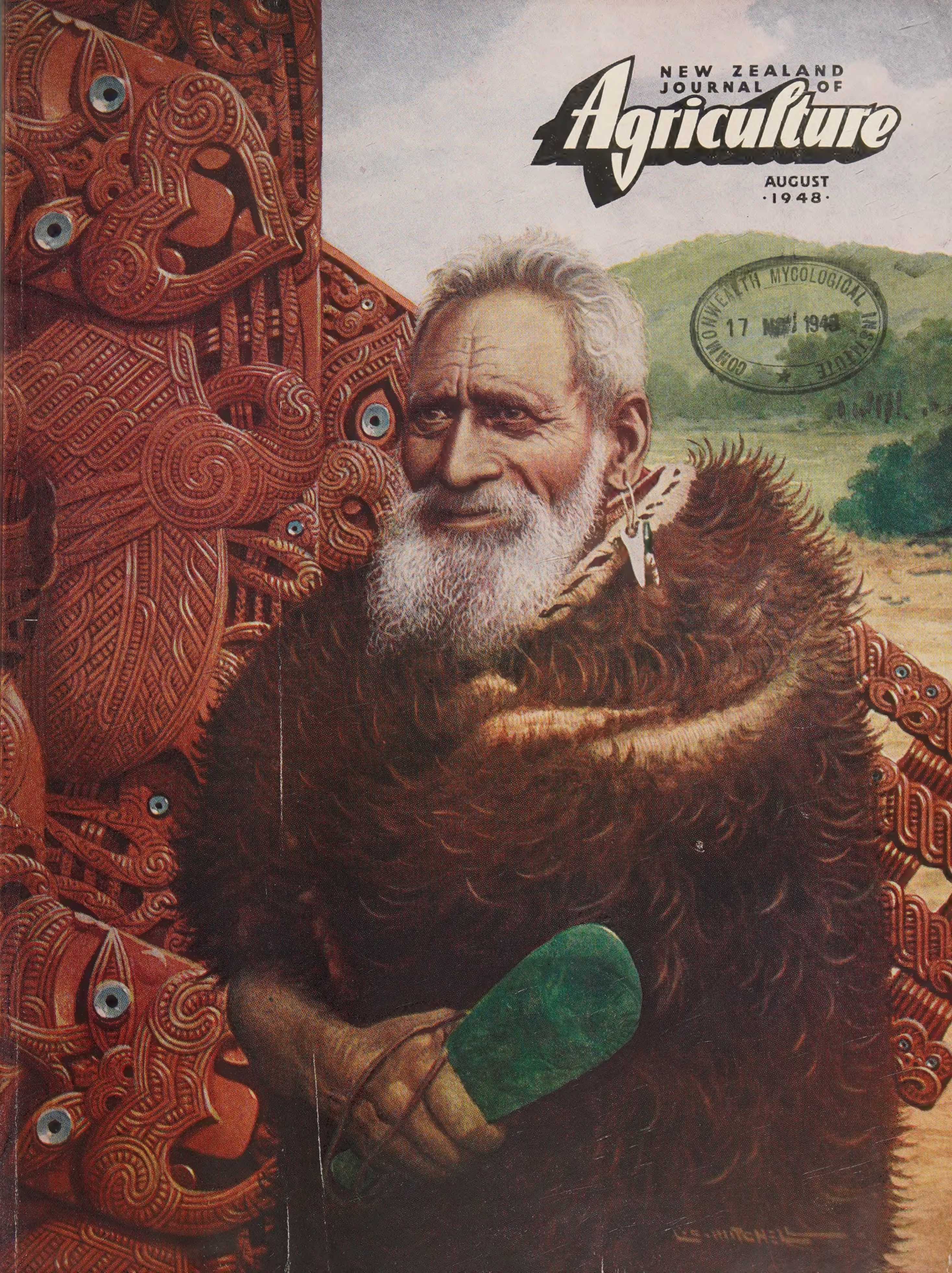

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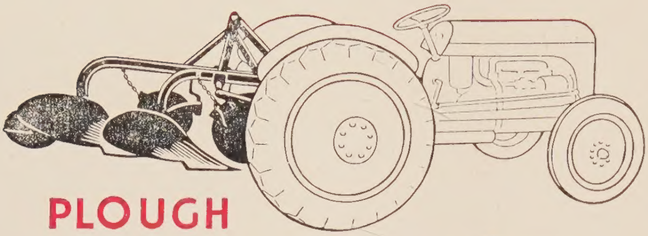

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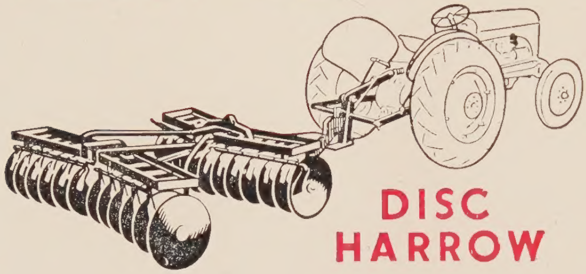

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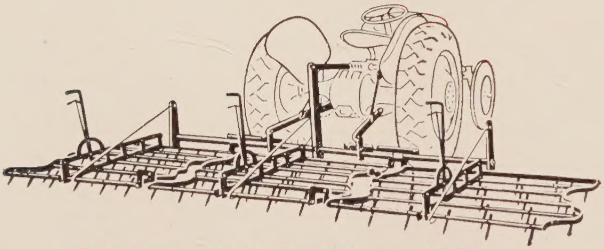

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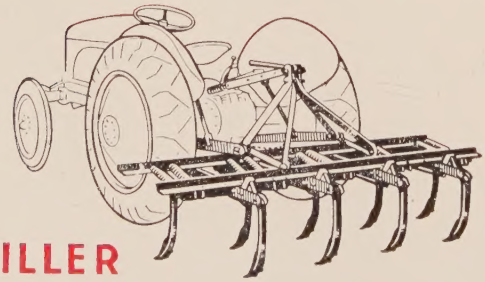

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Hon. E. L. Cullen,
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This month's cover

The enormous development made in agriculture in New Zealand in little more than 100 years of European settlement makes it difficult to realise that early settlers had to rely largely for their food supplies on the Maoris, who were skilled cultivators of food crops. That the Maori people of today have succeeded in adapting the skill of their forbears to European farming methods and have absorbed new developments in farming practice has been clearly shown by the valuable part they have played in the Aid for Britain campaign, which they have supported enthusiastically. The old Maori rangatira shown on this month's cover wearing a korowai (kiwi cloak) and shark's teeth earrings and standing by the carved front of a wharepuni (meeting-house) was painted by L. C. Mitchell from a photograph by R. Steele.

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SUBSCRIPTION RATES

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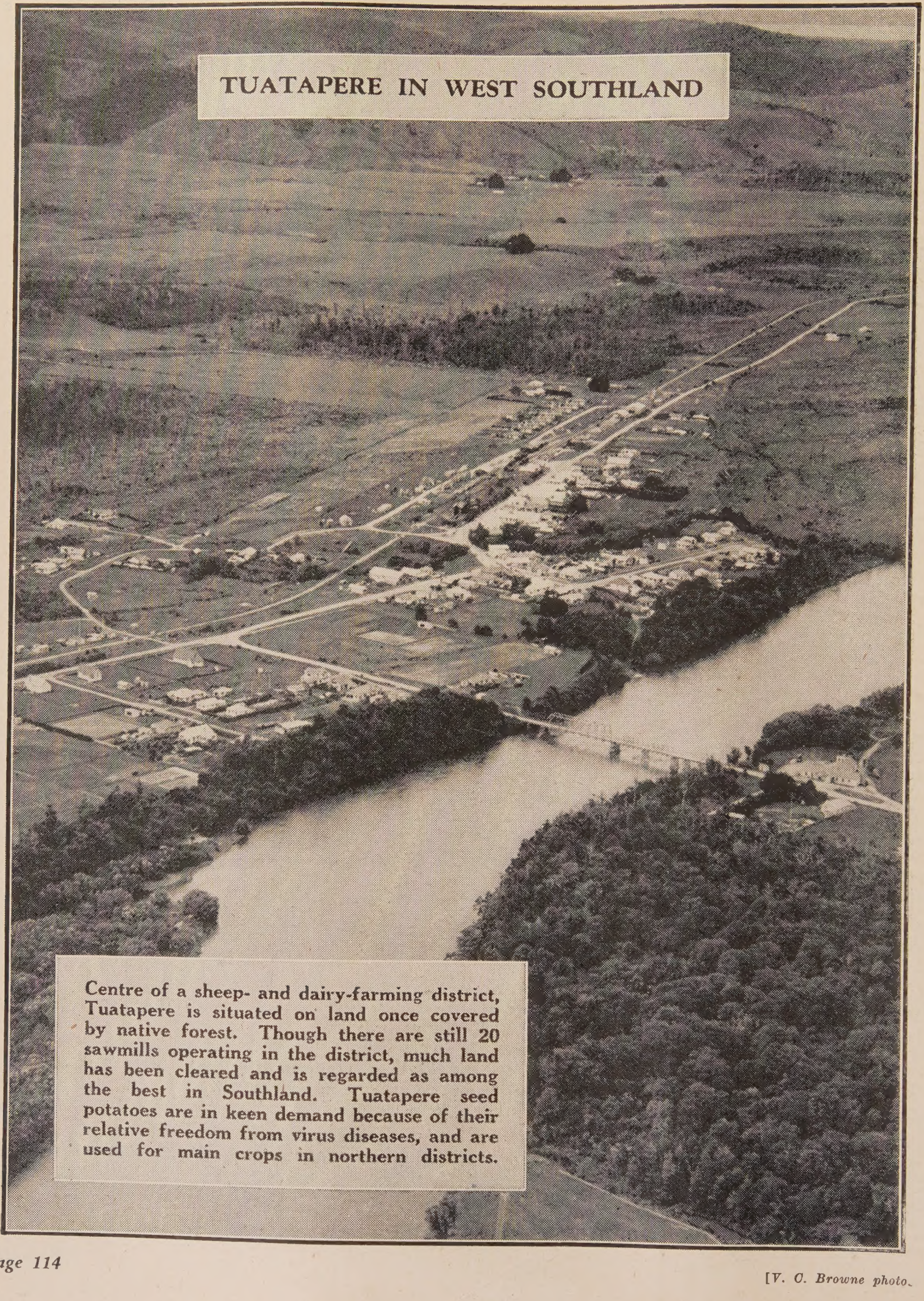
TUATAPERE IN WEST SOUTHLAND



Centre of a sheep- and dairy-farming district, Tuatapere is situated on land once covered by native forest. Though there are still 20 sawmills operating in the district, much land has been cleared and is regarded as among the best in Southland. Tuatapere seed potatoes are in keen demand because of their relative freedom from virus diseases, and are used for main crops in northern districts.

[V. C. Browne photo.

AMALGAMATION OF THE FIELDS AND RURAL DEVELOPMENT DIVISIONS

As a further stage in the progressive improvement of the instructional and information services of my Department I have arranged for the amalgamation of the Fields and Rural Development Divisions to form an Extension Division. In the past the spheres of each Division (although they have worked closely together) have been somewhat restricted from an extension point of view. The Fields Division has specialised in soil management and crop and pasture production and the Rural Development Division in farm management, agricultural economics, farm engineering, rural sociology, and farm forestry. The combination of the two divisions under one director will place local instructors in agriculture in a better position to serve the farming community.

In the end the onus of developing farm practice with science rests on the local instructor in agriculture. He is the link between farmers and between farmers and research workers. Both functions are equally important. He endeavours to raise the general level of farm practice to that of the most progressive farmers in the district and to improve practice with the aid of science. Instructors in agriculture are selected for their general knowledge of farming and their ability to impart knowledge to others. They are not specialists in restricted spheres, but rely on the help of specialists to assist in investigations of local farming problems. For efficient work it is necessary for instructors to be responsible for comparatively-small districts so that they may know the farmers and have their confidence. The amalgamation of the Fields and Rural Development Divisions will bring the specialists in both divisions and in research institutions in closer contact with the local instructor in agriculture and hence in closer contact with farmers.

Expansion of Local Investigation Work

I feel confident that the Extension Division through co-operative experiments and demonstrations will be able to expand the local investigation work which has long been a special feature of Fields Division activities. It is quite impossible to solve all local problems through research institutions, which must confine their attention to major problems, and, further, the results of institutional research must be tested out under local conditions. In the past the Fields Division has done excellent work in investigations of soil management and crop and pasture production and in future the scope of this work will be extended, and problems of farm management covering the production of crops and pastures and the management of livestock will be investigated.

The improvement of hill-country pasture lands will naturally be one of the major phases of the work of the Extension Division. The first essential work will be to disseminate among hill-country farms the knowledge already available as the result of trials carried out by the Fields Division and practices which have in the past been proved successful by land-improving pastoralists. This work must be followed by trials and investigations covering particular local problems and the evaluation of costs and returns.

The establishment of the Extension Division will also provide for close contact between farmers and the Departmental machinery officers. With the rapid development of farm mechanisation in the Dominion it has become apparent that the Department through its extension service must provide farmers with the latest knowledge of use and care of farm machinery. The farm machinery officers will now work through the local instructors in agriculture and their knowledge and advice will thus be freely available to all farmers.

Rural Sociology and Home Economics

The work in rural sociology and home economics initiated by the Rural Development Division will be continued under the Extension Division, and I feel that research and extension work in these fields will prove of increasing value in the future. To a very large extent the pioneering phase of land settlement in the Dominion is over: the future will demand ever-increasing study of the problems involved in rural and urban population movements if the Dominion is to continue to maintain a balanced economy.

I must say that in many ways I regret the passing of the name "Fields Division," for the Division has had a long and efficient record of service and has accomplished in a very large measure the work it was designed to perform in the limited fields of soil management and crop and pasture production. In this respect I am reminded that the late Mr. E. C. Clifton in his first annual report as Director of the Division recorded that the purpose of the experiments and demonstrations carried out by the Division "is to take the field and the experiment station to the farmer, to demonstrate the subjects of agriculture in which research is manifested, and especially to exhibit the merit of plants and crops and methods that are recognised as valuable." This work the Division has done, and in the past twenty-five years the remarkable developments which have taken place in grassland farming have been due largely to the demonstration plots on the use of fertilisers, lime, and improved strains of grasses and clovers laid down throughout the Dominion. The Extension Division has now the duty of providing a more complete service to farmers and I know that it will carry on and improve the work previously done by the separate Divisions before the amalgamation.

EDWARD CULLEN, Minister of Agriculture.

IDENTICAL TWIN CALVES FOR RESEARCH

Wanted at Ruakura This Season

IDENTICAL twin calves will again be required this season to enable special research work at the Department of Agriculture's Animal Research Station at Ruakura to be carried out. The co-operation of farmers in the South Auckland district enabled 51 sets to be collected last year, and it is hoped that a similar number will be obtained this season.

TWINS are called identical if they have developed from one egg fertilised by one sperm; such animals have exactly the same inheritance and so must be very similar in most respects. Ordinary or fraternal twins develop from two different eggs fertilised by two different sperms and are no more alike than full brothers or full sisters.

Recognition of Identical Twins

Identical twins are always of the same sex, but in addition they must be very similar in other respects such as size, head shape, hair whorls, coat colour, body conformation, and pigmentation of mouth, tongue, muzzle, ears, and hooves.

In examination for recognition of identical twins the calves' heads should be held together and each of these points examined separately. As experience has shown that identical twins show no differences in coat colour and colour distribution, great importance must be attached to these features. Any colour differences will show up more easily if a finger is pushed against the grain of the hair so that the undercoat can be seen. Hair whorls are usually found on the forehead, poll, back, and often above the eyes, and should generally be of approximately the same shape and in the same position on both calves. The calves should be turned on their backs and their bellies examined, as colour differences not previously noticed often show up there. Little attention should be paid to differences in white spotting.

Usefulness for Experimental Work

The greatest difficulty in experimental work with cows—the fact that they vary in their producing ability to such an extent that it is very difficult to make up two or more groups of cows of even productive ability—can be overcome if identical twins are split with one member of a set in each group. This provides the research worker with two groups of cows each with the same inheritance, and he is then certain that any differences in production are certainly due to differences in treatments and not to inherited variations in productive ability.

The usefulness of identical twins for experimental work can be calculated from the results of the 1946-47 season, when 9 sets of twins treated in the same way from birth were milked together under uniform conditions. To overcome the effect of different calving dates in the following season, all records are for the first 252 days.

TABLE I

Twin No.	Butterfat lb.	Twin No.	Butterfat lb.
T. 1	266	T.23	11
T. 2	280	T.24	6
T. 3	240	T.27	216
T. 4	248	T.28	221
T.11	222	T.29	242
T.12	216	T.30	245
T.13	212	T.31	17
T.14	211	T.32	17
T.17	322		
T.18	315		

The differences within the sets are very small, especially when compared with the vast differences between some of the sets. From these figures it has been possible to calculate that one set of identical twins can replace two groups each of 100 ordinary cows without loss in experimental accuracy.

The twins were regularly weighed and measured from birth to maturity and from these figures it has been found that for growth experiments one set of identical twins can replace two groups of 25 calves each.

Collection and Payment

Farmers south of Auckland who believe they have a set of identical twin calves are asked to advise Ruakura Animal Research Station, Private Bag, Hamilton, by letter or telephone (4790, Hamilton).

Farmers advising Ruakura by letter should give their exact and full address (district, road, and telephone number), as much valuable time may be wasted in trying to find the farm if an insufficient address is given. As soon as possible after receipt of advice an officer of the station will visit the farm and inspect the calves. Those judged to be identical will be bought at £2 10s. a head, plus 1s. 6d. a head per day up to 10 days of age to cover the cost of rearing. Older calves will be bought by arrangement. The station prefers to take over the calves when they are about a fortnight old.

It does not matter if the twins are small or out of low-producing cows.

Only identical heifer twins are required this year. However, a very limited number of unlike-sexed twins (bull-heifer) are needed for special experimental purposes. The requirements of these will be filled from farms in the immediate vicinity of Hamilton. As twins of this type are useless from a production point of view, only £1 10s. will be offered for them.

Farmers' Active Part in Aid for Britain Campaign

THE active part farmers had taken in the Aid for Britain campaign was referred to by the Dominion president of Federated Farmers (Mr. W. N. Perry) in a review of the federation's activities to the annual conference.

It would appear, he said, that wheat sowing would increase by about 33 1/3 per cent., which would give a total of about 200,000 acres of wheat.

Mr. Perry also expressed appreciation of the assistance received from the Aid for Britain National Council, and particularly from the chairman (Mr. F. P. Walsh), whose aid had been most valuable in helping to avoid bottlenecks. He deserved to be commended for the vigorous way in which he had prosecuted the campaign.

SEED PRODUCTION IN NEW ZEALAND

Montgomery Red Clover

By J. D. WRAIGHT, *Fields Instructor, Timaru.*

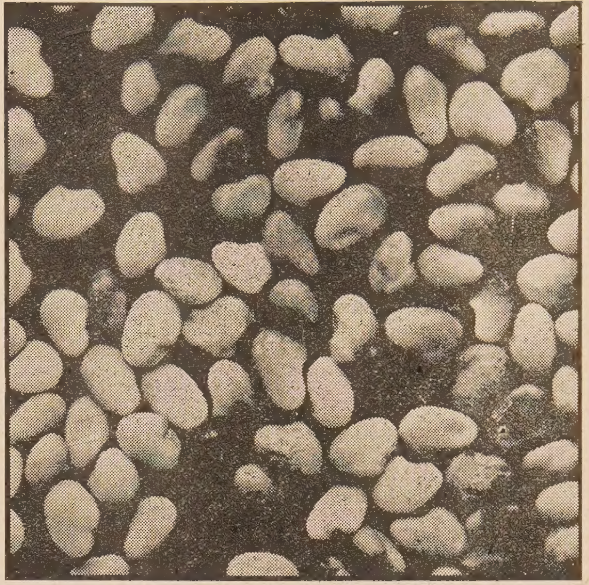
MONTGOMERY red clover *(Trifolium pratense L.)*, a late-flowering variety of the well-known red clover species, owes its popularity to its relatively-persistent nature. The seed is very similar to that of cowgrass (broad red clover), but the habit of growth is quite different. Cowgrass is an early-producing, open-crowned, tall-growing variety: Montgomery red clover is later producing, has a dense, rosetted crown with a shorter growth habit, and bears a greater percentage of leaf to stem. It is this dense crown which enables Montgomery red clover to stand up to hard grazing, particularly by sheep, as even after very heavy grazing the crown of a plant shows little or no damage and the plant is able to recover well.

THE colour and formation of flowers of Montgomery red clover differ little if at all from those of other varieties. The root system consists mainly of a sturdy taproot which enables the plant to penetrate stiff soils for its supply of moisture and plant food and allows the plant to flourish on all but the driest soils during the summer.

Place in Agriculture

The period at which leaf production of Montgomery red clover starts in the spring has a direct bearing on its usage as a valuable pasture constituent. It comes away somewhat later in the spring than do ryegrass, white clover, and cowgrass, beginning useful production in October. Leaf production increases from late spring to its maximum in midsummer and falls off during the autumn. If autumn growth is left over for light winter grazing, it stands up to cold conditions very well and is reasonably resistant to frost.

A Montgomery red clover sward evened up by grazing before being shut for seed.



Montgomery red clover seed.

Because of its late period of production some criticism has been levelled at Montgomery red clover, the critics claiming that it comes away too late in the spring to be of real value as a pasture plant. Montgomery red clover should be viewed as only an ingredient rather than the main species in a pasture mixture, for as a constituent it plays a very valuable part in the season's production, providing feed during the summer when other pasture constituents such as white clover and ryegrass have ceased production and will not contribute much feed until autumn.

In that way Montgomery red clover has gained a reputation for providing a large measure of reliability in a pasture, and according to requirements it is used in varying quantities in many types of seed mixtures. For ordinary permanent pasture mixtures it is included at the rate of 2 to 3lb. an acre in association with the usual species, including perennial ryegrass, white clover, and crested dogstail. For dry-land pastures which are required to stand up to rigorous summer grazing Montgomery red clover is included at 4 to 5lb. an acre, with cocksfoot (up to 10lb. an acre) and smaller quantities of other species such as white clover and perennial ryegrass. With short-rotation ryegrass or Italian ryegrass at about 30lb. an acre, 4 to 5lb. of Montgomery red clover gives very useful short-term pastures which fit in well with some types of farm rotations.

Introduction to New Zealand

During the period of pasture improvement which began in New Zealand in the late 1920's it was found that improved strains of perennial ryegrass, white clover, and cocksfoot could not in themselves give maximum grazing over the whole grazing season, and that some clover species which would give summer production was required to complete the number of useful and improved strains which could be offered to farmers. It was realised that cowgrass was useful in this respect, but that it was too short lived and was more useful as a hay species. Small quantities of Montgomery extra late-flowering red clover, as it was then known, were imported in the late 1920's and grown in Canterbury, where it was soon found to be of definite use for the production of summer feed. Seed produced in Canterbury was bought by farmers elsewhere in New Zealand, and before many years the clover was accepted as a very useful pasture ingredient in that it could be grazed or could be used as a hay or seed crop, recovering quite well from either of these crops and producing excellent aftermath feed.

MONTGOMERY RED CLOVER SEED PRODUCTION

The saving of Montgomery red clover for seed on very heavy land is not recommended because a large bulk of growth is produced and the clover tends to smother itself out.

The first two areas entered for certification were one in Canterbury and one in Otago. The Canterbury area was of 2 acres, sown in the Leeston district in the spring of 1929. It was harvested in the 1931-32 season, yielding a total of 517lb. of machine-dressed seed. The Otago area was in the Maungawera district, near Wanaka. This area of 7 acres was sown in the spring of 1930 and was harvested in the 1931-32 season, producing 2207lb. of machine-dressed seed.

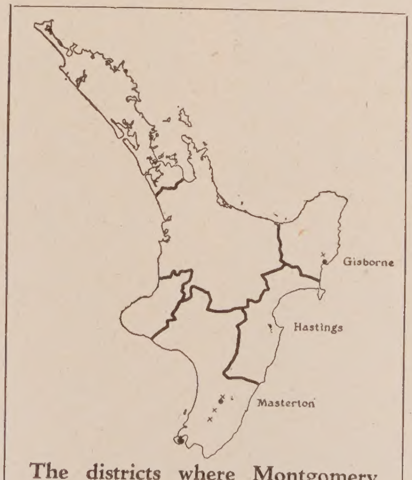
Subsequently areas were sown for seed production in various parts of Otago and Southland, and later in the North Island. The table on page 122 shows the rapid increase that has taken place. It was tried out on many types of country, ranging from the shingle plains to the alluvial flats, but as a seed producer it has proved to be most successful on the rolling clay country of Otago and Southland.

As the practice of seeding Montgomery red clover areas increased a good export market was found for the seed, and from the ready sale which it enjoys it is obviously meeting with favour as a pasture clover overseas. Reports show that it has been generally accepted in the British Isles, as it produces plants indistinguishable from British-grown Montgomery red clover.

Effect on Farming Practice

In arable farming districts with 25in. of rainfall or less mixed farming is usually practised, as the growth of grass is not sufficiently reliable for the land to be stocked to the maximum. Thus cereal crops and seed production provide an important part of the mixed farm income.

The relationship between small seeds production and sheep-carrying capacity was revealed in an investigation which showed that farmers who had developed some seed production had also been able to enlarge their flocks because of increased reliability of their pastures. A large measure of this reliability of production under difficult climatic conditions was the result of the use of Montgomery red clover, areas of which were sown mainly with seed production in view.



The districts where Montgomery red clover seed is harvested in the North Island are shown by crosses.

Districts Suitable for Seed Production

Seed production of Montgomery red clover has been established mainly in the South Island and in districts with reasonably-good weather for the harvesting of the crop. Those conditions are to be found in Hawke's Bay, Marlborough, Canterbury, North Otago, and the drier parts of the remainder of Otago.

In Marlborough it was found that so much cowgrass was harvested that this district was not entirely suitable for the production of pure seed of Montgomery red clover because of cross-pollination and volunteer growth of cowgrass, with the result that the acreage grown there is small and maintained only in areas free from contamination. In the other districts cited good isolation of crops is possible and large areas of Montgomery red clover are entered for certification, the percentage of areas accepted being high.

Climate and Soil Requirements

The climatic conditions most suitable for seed production of Montgomery red clover are typically those occurring in Canterbury and similar districts in a normal season—rainfall of about 25in. a year, mainly in winter, spring, and early summer, a fairly-high sunshine record, and good summer conditions. Too little rain in the winter and spring will cause lack of growth before the shutting of the seed areas, and too much rain in the summer will cause a rush of growth which prevents normal flowering and seed setting. During autumn and early winter dry conditions with some frosts are most helpful in cutting back leaf growth and generally simplifying harvesting conditions.

The soil conditions required for the best establishment and growth of Montgomery red clover exist on the medium-quality clay downs soils, as the most essential requirement of the plant is a cool, moisture-retaining subsoil. It is fairly tolerant of the acid soil conditions on this type of land, but responds outstandingly to applications of lime and, like all the useful clovers, requires frequent applications of phosphatic fertiliser to ensure maximum production. Montgomery red clover persists fairly well on the light, dry, shingly plains soils, but the leaf growth tends to wilt badly in times of drought. On the other hand, on the heavy, deep, loam soils a pure or dominantly red clover sward, if mismanaged, tends to produce too much bulk and is inclined to smother itself out. In this respect the heavy soils are more suitable to the seeding of cowgrass, which can be controlled mainly by the taking of a hay crop and then being allowed to seed.

Soil requirements are closely associated with agricultural practice, and that applies particularly to the use of

Montgomery red clover. On the soil type best suited to its establishment and growth the agricultural practice is sheep grazing and mixed farming, with paddocks of 20 to 30 acres and frequently larger. Under such conditions Montgomery red clover is easily controlled by being grazed, and surplus growth can be converted into a manageable seed crop without undue damage to the pasture through smothering.

Place in Rotation

Seed stands or pastures which have been used as such fill quite a useful place in a mixed farm rotation, particularly in one based on three to four years in pasture and three or four cash or feed crops before sowing out again to pasture. Run-out red clover stands provide excellent conditions for wheat, linseed, and other white crops, and the increased fertility of the land after the growing of red clover is reflected in higher yields.

The establishment of red clover fits in well with the average mixed-farm rotation in that it can be sown out in spring under a cereal crop or with rape and other supplementary feed crops planted in late spring.

Area to Close for Seed

As seed is produced mainly under mixed farming conditions, the acreage which can be saved for seed depends to a large extent on the feed position at shutting-up time. If a surplus of feed is certain, considerable areas will be closed for seed. That applies not only to such crops as ryegrass and white clover, but also to Montgomery red clover. The 1947-48 season in South Canterbury demonstrated that very well: Because of dry conditions the feed position was acute, with the result that only a small acreage of red clover was harvested for seed.

Another limiting factor to production of red clover seed is the population of humble-bees in any district in relation to the acreage of clover being saved for seed. In years of very large acreages seed yields were disappointing, which is attributed to insufficient humble-bees working on the clover at flowering time. In damp years white clover persists in flowering at the same time as red clover and offers considerable competition, because the honey bees show a definite preference for white clover nectar.

Seeds Mixtures

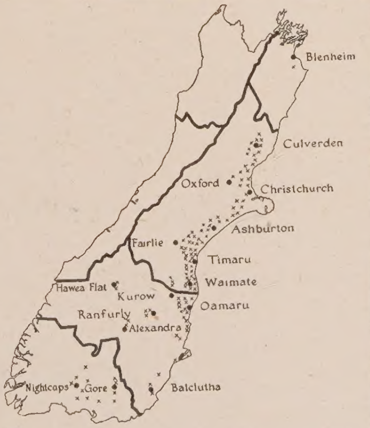
Seeds mixtures vary with the length of life required from a seed stand and with the time and method of sowing. For areas sown out either into established cereal crops in spring or with rape or supplementary feed the following mixture is usual: 30 to 40lb. of perennial ryegrass, 4 to 5lb. of Montgomery red clover, and 2 to 3lb. of white clover. For areas sown without a cover crop (usually in early autumn) on fallowed land 10 to 15lb. of perennial ryegrass and 4 to 5lb. of Montgomery red clover are used.

The reason for the difference in quantities of ryegrass in the two mixtures is that sowing with a cover crop tends to repress grass growth and consequently a high seeding is required for sufficient ryegrass establishment.

MONTGOMERY RED CLOVER SEED PRODUCTION

Montgomery red clover can be established successfully with a wide variety of cover crops. In the area illustrated the clover seed was sown with oats.

Montgomery red clover is seldom sown without some association of ryegrass, as it is found to be unpalatable to stock if treated in this way and difficulties are experienced in controlling areas by sheep grazing before the area is shut up for seed. Cocksfoot and other summer producing species are not used as associate grasses with red clover seed stands, as they produce too much bulk of leaf to allow free flowering of the clover.



The districts where Montgomery red clover seed is harvested in the South Island are shown by crosses.

Cover Crops

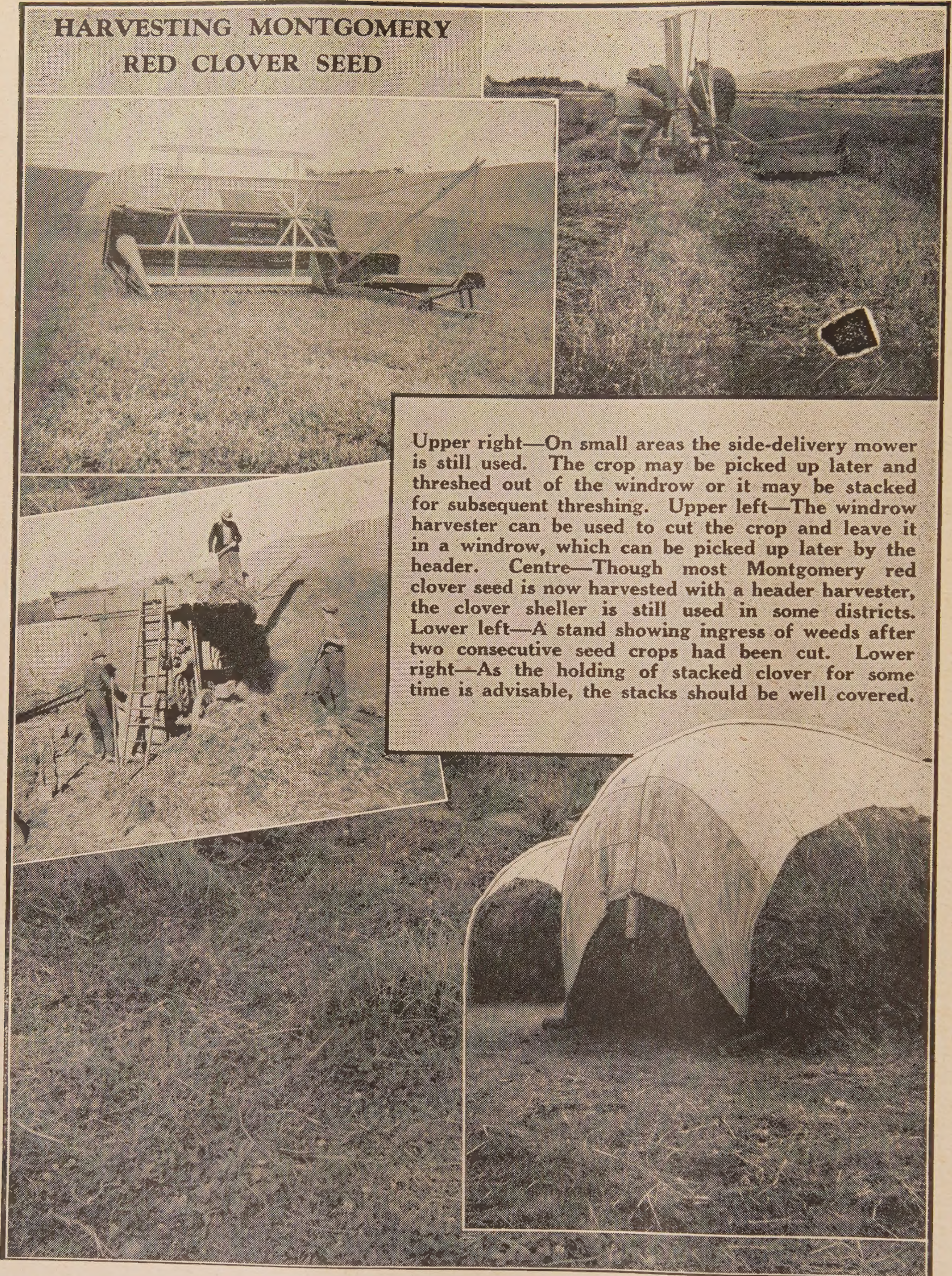
Montgomery red clover's ability to establish well under a number of cover crops has been a big factor in the rapid expansion of its general use. For years after it was introduced Montgomery red clover was oversown in spring on to autumn- or winter-sown wheat, and gradually other cover crops also came to be used in its establishment. It is now used for sowing down under oats, barley, linseed, and linen flax. (The pulling of the linen flax crop does not disturb the grass and clover seedlings.)

When sown down with rape and other supplementary crops Montgomery red clover establishes well and comes away rapidly after the feed crop has been eaten off.

Time and Method of Sowing

The time of sowing depends not only on the factors which will influence the growth and establishment of the red clover plants, but also on the effect of other species included in the seeds mixture. When sown by itself Montgomery red clover will establish well on a good seed-bed as late as the end of March, but when it is sown in a mixture with ryegrass the ryegrass establishes well at the expense of the clover plants, which are suppressed and subject to frost lift.

HARVESTING MONTGOMERY RED CLOVER SEED



Upper right—On small areas the side-delivery mower is still used. The crop may be picked up later and threshed out of the windrow or it may be stacked for subsequent threshing. Upper left—The windrow harvester can be used to cut the crop and leave it in a windrow, which can be picked up later by the header. Centre—Though most Montgomery red clover seed is now harvested with a header harvester, the clover sheller is still used in some districts. Lower left—A stand showing ingress of weeds after two consecutive seed crops had been cut. Lower right—As the holding of stacked clover for some time is advisable, the stacks should be well covered.

MONTGOMERY RED CLOVER SEED PRODUCTION

Sheep grazing Montgomery red clover aftermath in early winter on medium-fertility land in the Hakataramea Valley, Canterbury.

In a sowing trial conducted at Lincoln a mixture of ryegrass and red and white clovers was sown at the beginning of each month from October to April. In the following autumn counts were made of the number of red clover plants in each sowing and the results were:—

Date of sowing	Average number of red clover plants per square yard
October-December ..	63
January-February ..	16
March-April	2

Red clover seed may be sown broadcast or drilled in lightly through the coulters, according to the soil conditions at time of sowing; in either case it is important that the land be well consolidated, and for evenness of depth it is wise to sow on a rolled surface. If conditions are dry, drilling the seed into the tilth where some moisture will be found is preferred, but under normal conditions broadcasting followed by harrowing gives excellent results. A recently-produced drill coulter allows the seed to be broadcast just beneath the surface of the soil, and under the difficult, dry conditions sometimes experienced in Canterbury this method of sowing has been very successful.

Lime and Fertilisers

As most of the country suitable for the seeding of red clover is slightly acid, successful clover establishment and growth depend to a large extent on applied lime. Regardless of previous applications of lime, most stands receive a further dressing of a ton an acre when sown down and maintenance applications during the life of the pasture.

Some idea of the importance of lime to the establishment of Montgomery red clover can be gained from an observation carried out by Canterbury Agricultural College in 1936, when a pasture mixture consisting of 25lb. of perennial ryegrass, 7lb. of cocksfoot, 3lb. of red clover, and 2lb. of white clover was sown, part on land which had received no lime, and part on land which had received 2 tons of lime an acre 12 years previously. An analysis of the pasture in the second autumn, when it was 15 months old, gave the following percentages:—

	Limed area	Unlimed area
Ryegrass ..	60	90
Cocksfoot ..	5	5
Red clover ..	20	4
White clover ..	15	1

Seed production can be assisted by the application of phosphate both at sowing down and as topdressing on the established seed stand. Spring applications of about 2cwt. of superphosphate an acre increase seed yields and also hasten maturity of seed crops.

Treatment Before Closing

The treatment of Montgomery red clover stands before they are closed for seed varies with the soil type and the size of the paddocks. On heavy land and on a small area hay is frequently taken and the aftermath growth saved for the production of the seed crop. In that case the area is grazed only lightly in the very early spring and the bulk of the spring growth is conserved for the hay crop.

On the other hand, large areas on medium to light land are grazed, usually with sheep, and then allowed to go to seed. Such grazing is usually light in early spring, and as soon as vigorous production begins in October heavy grazing is maintained to keep the growth under control until the field is closed.

Time of Closing

The time of closing Montgomery red clover stands varies with the season and the amount of rainfall in winter and spring. In a dry season when growth has been poor most grazed stands will be closed toward the middle of November, but in years of adequate rainfall closing the stand before the middle of December causes growth to be too rank.

With hayed stands the position is somewhat similar. When spring growth is vigorous the hay crop can be taken in late November and, provided the hay is off the area by the early part of December, sufficient aftermath growth will take place to make a seed crop. In dry years an early and probably light cut of hay is taken in October and the stand allowed to recover as early as November.

Once a stand of Montgomery red clover has been shut for seed it is not usual or wise to allow any stock to run over the stand, as all clover growth is much relished by stock at this time.

Treatment After Closing

It is not usual to have to give any treatment to a red clover stand once it has been shut for seed, but when the growth has become uneven as the result of preferential grazing by sheep, or when heavy rain falls after the area has been shut, with consequent rapid growth of clover, topping the stand with a mower has been resorted to with quite good results. Topping tends to even growth conditions and results in more even flowering and ripening of the seed throughout the stand.

YIELDS OF MONTGOMERY RED CLOVER SEED IN SOUTH CANTERBURY, 1945-46 SEASON

Harvest year	Number of areas	Acres entered	Acres harvested	Percentage harvested	Acres machine dressed at 20/8/46	Percentage machine dressed at 20/8/46	Machine dressed yield (lb.)	Percentage loss in machine dressing	Machine dressed yield per acre (lb.)
First ..	453	6,715	4,752	70.7	2,318	49	213,484	36.6	92.1
Second ..	386	5,173	2,847	55.1	1,334	47	103,829	33.6	77.7
Third ..	195	2,751	1,148	41.7	414	36	31,655	44.6	76.5
Fourth ..	118	1,467	644	43.9	356	58	15,645	34.0	44.0
Totals ..	1,152	16,106	9,391	58.3	4,422	47	364,613	35.8	82.5

Irrigation

The value of irrigation to a pasture species such as Montgomery red clover when it is grown for a seed crop on light, dry soils is generally appreciated, and under irrigation seed stands behave as well as they do on better soils. Montgomery red clover is an excellent indicator plant for the irrigation farmer, as it shows signs of wilting as soon as soil moisture becomes low, but growth will fall off if the stand is over-irrigated.

Irrigation methods for seed stands of Montgomery red clover depend to a large extent on rainfall for the season, but on light, porous soils stands are usually watered in autumn and again in spring before being closed for seed. Unless unusually dry conditions are experienced, there is little need for irrigation after the area has been closed for seed, as it tends to cause too great a growth of leaf.

Irrigation is very beneficial to a red clover stand after the seed crop has been taken, as it assists materially in the recovery of the plants.

Harvesting the Crop

Very little seed is set after the end of March because of colder conditions and frosts, and the time of harvest depends on the weather experienced after seed setting. In dry years there is little second growth of leaf to hinder harvesting, so the crop may be harvested in March and April. In a wet autumn second growth of leaf is troublesome and retards harvest until heavy frosts have cut back the leaf growth.

The method of harvesting a crop of Montgomery red clover depends on size of area and conditions at harvest time. For example, small areas carrying some leaf growth may be cut with an ordinary or side-delivery mower and either picked up and threshed from the paddock or stacked to be threshed later in the year. On larger areas it is not practicable to employ that method, and usually the crop is direct headed, which is not undertaken until the leaf growth has disappeared and the crop is fit, in both stalk and seed head. Some loss of seed results from waiting until all the crop is fit for direct heading, and under conditions such as were experienced in South Canterbury during the 1948 harvest probably the best method would be to mow the crop as soon as the seed is coloured in the latest-set heads, and then after a period of some days to pick up and thresh with a header harvester.

For the maximum amount of seed to be saved threshing must be carried out only in sunny weather and after the dew has dried off the standing crop or the swath. In the later afternoon dew-fall causes unfitness and consequent difficulty in threshing. Clover which has been mown and has become wet may be lifted mechanically with a swath lifter or "aerater," which lifts the rain-battered swath off the ground and assists materially in drying out the crop. After lifting, threshing can usually be proceeded with almost immediately.

Setting of Machine

Much damage has been caused to seed by improper settings of the drum or riddles, particularly in header harvesters, and this damaged and chipped seed cannot be removed in dressing. The proportion of seed with visible damage is also an indication of even more serious though invisible damage to other seeds. This unseen damage results in such seed, when germinated, producing abnormal seedlings, because of injury to the internal part of the seed such as the cotyledon. Such seedlings fail to produce a normal plant and usually die at a very early stage.

Damage may be caused in several ways: The drum speed may be too high, or the use of too fine a riddle

CERTIFICATION OF MONTGOMERY RED CLOVER SEED

District	1931-32	1932-33	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48
Poverty Bay ..									2	3	24	31	65	88	105	97	96
Hawke's Bay ..						3	7	7	42	132	291	119	90	50	59	21	12
Wanganui ..																	34
Manawatu ..																	15
Wairarapa ..				35	9	7	7	7	17	10	11		49	261	495	410	389
Nelson															29	73	46
Marlborough ..							8	13	13		43	34	21	47	134	61	162
Nth. Canterbury	2	52		70	45	128	49	69	89	307	577	767	1,201	2,151	2,615	2,245	1,853
Christchurch	Previously included in Nth. Canty.						146	152	54	222	299	632	924	1,304	1,652	1,317	1,239
Mid-Canterbury						10	19	75	56	175	281	756	1,206	1,674	1,739	1,610	1,714
Sth. Canterbury			131	178	172	430	669	605	783	1,738	3,231	6,861	12,358	15,346	15,785	9,842	7,114
Waimate ..	Previously included in South Canterbury															3,334	1,793
North Otago ..			7	69	30	58	49	240	349	625	1,029	1,863	1,761	2,432	2,378	2,511	1,849
Palmerston ..	Previously included in North Otago, Maniototo, and Otago																1,152
Maniototo ..	Previously included in Central Otago and Otago									4	4	81	261	421	719	986	304
Central Otago ..	7	7	10	20	27	10	10	20	13	51	91	353	372	238	416	370	400
Otago		12	12	20	21	26	88	123	190	384	594	711	631	969	1,524	878	70
South Otago ..										10	10	25	66	61	90	229	264
Gore									31	108	336	820	515	392	358	457	470
Southland ..					8	8				21	110	478	486	361	660	851	869
Dominion ..	9	71	160	392	312	680	1,052	1,311	1,639	3,790	6,931	13,531	20,006	25,795	28,758	25,292	19,845

setting may cause too great a proportion of the seed to be returned to the drum for rethreshing. In other cases it may be the result of too close a setting of the drum to the concave, or the use of worn-out drum beater bars.

Damage is frequently associated with the threshing of material which is out of condition when an attempt is made, by altering the machine setting, to obtain the maximum extraction of seed. The only remedy then is to defer operations until conditions are more satisfactory, even if that necessitates delay and modification of the threshing programme.

Clean threshing and sound seed can be achieved if the operator is prepared to thresh only when the crop is sufficiently dry, and as the product is valuable, care should be taken to ensure that the maximum extraction is obtained without damage to the seed.

Yields

Yields of Montgomery red clover seed have caused some concern to growers, because they appear to be not as good as expected and certainly lower than those secured from cowgrass. Yields of Certified seed were 103lb. of machine-dressed seed an acre in the 1933-34 season and 151lb. an acre in the 1938-39 season, but the average has fallen considerably, mainly because many old and run-out areas have been harvested. It is obvious that the best yields come from the first-harvest areas and that yields fall with the age of the stand.

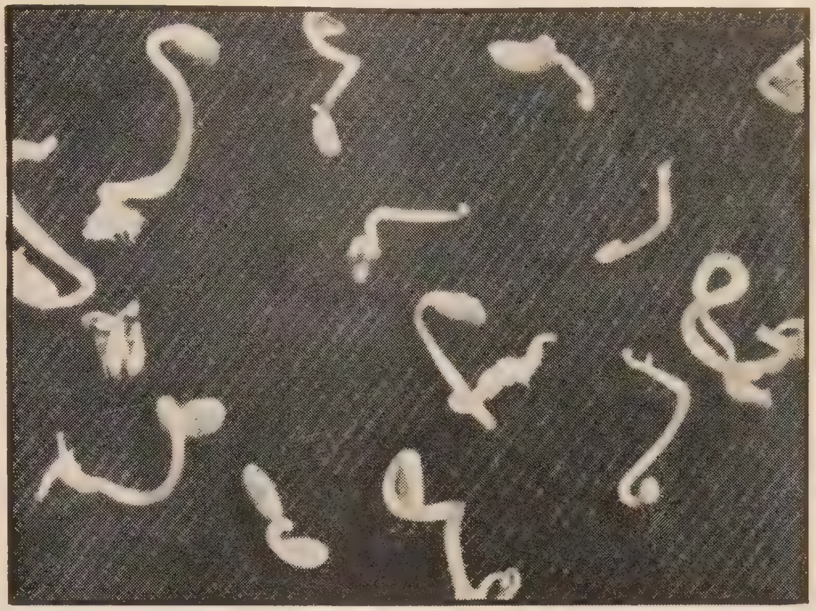
The table at the top of the opposite page gives yield data of Certified areas in South Canterbury in the 1945-46 season. Included in the third-harvest areas were two which yielded exceptionally well, and without these the average is 60lb. an acre. The yields shown are averages and do not give full credit to the many good farmers who frequently secure yields far above this average. Yields of 200lb. an acre are not uncommon, and three times that amount has been secured on rare occasions.

Impurities in Seed

The header harvester now provides practically the sole means of harvesting red clover, and samples "off the header" are not nearly as clean as were those from clover shellers or threshing mills. That can be accounted for by the minimised riddle capacity of the travelling harvester. Samples in the main contain more pug (clover pods and broken-up leaf and stems), so losses in dressing are larger than those in seed threshed by mills.

The chief impurity of red clover seed is broken and damaged seeds, which, with husks and dirt particles, are classed as inert matter.

Weed seeds which are difficult to extract completely in the machine dressing of a line of red clover seed are ribgrass (*Plantago lanceolata*), dock (*Rumex obtusifolius*), and sheep's sorrel (*Rumex acetosella*), though dock and sorrel seeds are now less prevalent in machine-dressed samples than they were before improved methods of machine dressing were evolved in recent years. The seed of dodder (*Cuscuta epithymum*), a parasitic plant which attacks red clover, is difficult to eradicate from a sample of machine-dressed seed and, as the importation into some countries of seed containing this impurity is prohibited, its presence in a line lowers the value.



[*Elmar Studios photo.*

Seed that is threshed too hard may often produce abnormal seedlings, several types of which are shown above.

Origin of Strains

The original strain of Montgomery red clover introduced from England was a late-flowering type with a fair amount of variation. This type was carried on under the certification scheme until a selection was made by the Grasslands Division of the Department of Scientific and Industrial Research of a more valuable type with a longer period of maximum production. An English pedigree strain, bred by the Aberystwyth Plant Breeding Station and identified as S123, was introduced into New Zealand in 1938, but this strain showed no superiority under New Zealand conditions. Selection work by the Grasslands Division is continuing. Supplies of the New Zealand Pedigree strain were distributed into commerce in 1939, when the first release of Certified Government Stock seed was made. This Pedigree strain is rapidly replacing the original strain introduced from England.

Seed Certification

The certification of Montgomery red clover seed is aimed at producing seed of a high standard of trueness to type. Purity of strain is controlled carefully by paddock inspections closely correlated with the origin of the seed sown and plot tests of samples of the seed harvested. Subject to satisfactory field and plot reports, the following grades of seed are certified:—

Pedigree seed—seed harvested from areas sown with Government Stock seed distributed by the Department of Agriculture from nucleus stocks produced by the Grasslands Division of the Department of Scientific and Industrial Research.

Mother seed—seed harvested from areas sown with Pedigree seed.

Standard seed—seed harvested from areas sown with Mother seed.

The final purity required of all machine-dressed Certified Montgomery red clover seed before it is tagged and sealed is 96 per cent., with a maximum of not more than 1 per cent. of weed seeds.

The acreages of Montgomery red clover entered for certification in New Zealand since its introduction are set out in the table at the bottom of the opposite page.

Effect on Pastures

The effects on a pasture which has been used for the production of Montgomery red clover seed vary; damage may be slight or intense according to the amount of growth occurring in the seed crop. This top growth suppresses grass growth, and the general effect is the thinning out of ryegrass in particular. After a very heavy seed crop all pasture plants are choked out in some places, with the result that weeds, particularly Yorkshire fog, goosegrass, and thistles, invade the stand. Careful after-treatment of the stand can minimise this damage and, if the seeding of Montgomery red clover is put in its true perspective on the average mixed farm, it should be possible to take seed from surplus growth of Montgomery red clover-dominant pastures and still leave quite a good grazing sward.

EXPORTS OF MONTGOMERY RED CLOVER SEED

Year	United Kingdom cwt.	United Kingdom Value (£)	Australia cwt.	Australia Value (£)	U.S.A. cwt.	U.S.A. Value (£)	Eire cwt.	Eire Value (£)	Sweden cwt.	Sweden Value (£)	Belgium cwt.	Belgium Value (£)	Other countries cwt.	Other countries Value (£)
1942	3,086	49,171												
1943	5,407	75,840	46	863	2	32	71	756						
1944	6,589	107,355	26	496		3	625	10,834					4	62
1945—														
Certified ..	2,728	64,993	13	296			41	1,026	104	1,181				
Uncertified ..	1,944	46,231	60	1,526			194	4,294						
1946—														
Certified ..	4,319	130,150	85	2,510			276	8,302						
Uncertified ..	3,887	111,393		6			274	7,315						
1947—														
Certified ..	4,429	130,835	28	575			318	9,074					2	52
Uncertified ..	4,363	116,276					251	6,267			56	1,148		

The aim of the "small seeds industry," as it is frequently called, is not to grow pure stands of any one species, but first to establish a good, high-producing sward in which the species to be considered for seed harvesting is dominant.

In years of surplus growth this pasture can provide additional income from its seed crop and it should then take its place in the grazing economy of the farm unit. Too much damage to pastures has been caused by indiscriminate seeding of areas, often by seeding them too frequently, and that has resulted in unfair criticism of the practice of seeding and also in a high cost of renewal which could have been avoided.

Maintenance of Seed-producing Areas

The prospects of a seed stand's continuing to produce payable crops depend to a large degree on the treatment given after harvest.

As second- and subsequent-harvest stands are particularly subject to attack by porina grub, all straw should be swept off the area as soon as the harvest is completed. Some chance of recovering leaf growth before the winter should be given the plants, and recovery growth should not be grazed, but should be saved until the plants are flourishing and some concentrated stocking becomes possible on the area. That is preferable to running a few sheep on the area and defoliating the plants when they are trying to recover from a seed crop. Hard winter grazing of seed stands is not to be recommended, as it will cause the main spring growth to be up to a month later in starting than on a winter-spelled area.

As the seeding of Montgomery red clover stands is a part of a mixed-farming rotation, and provided new stands are being laid down each year, it is not necessary to seed each stand more than twice, as the first two years' seed crops are the most remunerative. Stands which are seeded once or twice and then allowed to become grazing areas are quite satisfactory to both the seed and the grazing programme of the average mixed farm.

Pests

Red clover seed stands are not affected by many fungoid or insect pests, though red clover thrips made themselves very apparent some years ago. Some damage to seed was caused by thrips in the clover seed heads, but it was not nearly as bad as the vast number of thrips to be found in a crop would suggest.

During wet years slugs cause damage to stems and crowns of red clover plants, but in dry years they are not to be found in great numbers.

Porina moth has caused widespread damage to stands, but if adequate precautions are taken in the removal of straw and the area is baited with a bait consisting of bran, Paris green, and molasses, damage from this source can be minimised.

Utilisation of Seed

Practically all the Montgomery red clover seed sown in New Zealand has been used in the establishment of permanent pastures and seed stands on fully-arable land, and only small quantities, mainly seconds and inferior seed, have been used for surface sowing of hill country and bush burns on pastoral country.

A large percentage of the seed produced has been exported, and the table on this page gives details of exports for the past six years.

Price Fluctuations

Price has been an important factor in the seeding of Montgomery red clover, as it has always been more attractive than that offered for cowgrass, and price alone has been a decided inducement to farmers to close areas for seed. From 1939 to 1943 export prices were about 3s. 3d. a pound, and in 1944 they ranged from 3s. 6d. to 3s. 8d. In 1945 and 1946 prices fluctuated as much as 1s. a pound because of the demand from England and the smaller New Zealand crop, averaging 6s. to 6s. 3d. a pound. In 1947 some seed was sold overseas at about 5s. 3d. a pound, but since then prices have receded appreciably.

METEOROLOGICAL RECORDS FOR JULY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit): Approx. mean	Difference from normal	Absolute maximum and minimum: Maximum	Minimum	Rainfall in inches: Total fall	No. of days of rain	Difference from normal	Maximum fall: Amount	Date	Bright sunshine hours
Waipapakauri ..	6	53.7	+ 0.8	65.4	36.7	7.34	22	+ 2.07	0.97	19	
Auckland	160	53.6	+ 2.1	62.3	42.0	6.76	23	+ 1.08	2.71	20	114.2
Tauranga	10	50.6	+ 2.2	62.0	34.0	6.86	18	+ 1.80	2.47	7	153.3
Ruakura	131	48.0	+ 1.2	63.2	25.1	4.46	21	— 0.38	0.79	29	104.3
Rotorua	980	47.4	+ 2.8	61.0	30.0	8.70	13	+ 3.72	2.88	7	132.8
Gisborne	12	50.2	+ 2.6	63.9	32.2	2.57	12	— 1.76	0.68	8	133.7
New Plymouth ..	160	51.2	+ 2.6	63.0	37.8	8.19	21	+ 1.87	1.27	20	119.0
Taihape	2157	44.3	+ 2.9	57.8	30.2	2.65	22	— 0.42	0.45	3	
Napier	5	49.6	+ 2.8	65.3	31.4	1.85	13	— 1.70	0.39	25	120.2
Wanganui	72	50.0	+ 3.2	61.1	35.3	4.16	21	+ 0.90	0.63	31	107.5
Palmerston North ..	110	48.6	+ 3.1	61.0	31.7	3.12	18	+ 0.01	0.39	14	94.8
Waingawa	350	46.0	+ 1.9	60.0	28.5	5.11	18	+ 0.99	1.30	31	104.6
Wellington	415	48.0	+ 1.7	59.8	38.9	7.41	24	+ 2.32	1.27	2	84.6
Nelson	24	48.2	+ 2.9	61.7	33.4	5.48	19	+ 2.05	0.79	2	131.5
Blenheim	12	47.1	+ 3.2	63.0	30.6	6.53	17	+ 3.80	1.88	25	143.1
Hokitika	12	46.2	+ 2.5	61.6	29.2	5.85	19	— 2.86	0.96	10	110.5
Hanmer Springs ..	1225	41.0	+ 2.9	60.0	23.0	6.63	17	+ 2.37	1.41	25	105.4
Christchurch ..	22	44.4	+ 2.2	65.8	29.0	2.61	16	— 0.05	0.64	20	96.5
Ashburton	323	43.1	+ 3.0	63.0	25.4	3.21	11	+ 0.56	0.70	26	103.0
Timaru	56	43.4	+ 2.1	61.2	25.0	3.26	12	+ 1.53	1.20	23	101.7
Alexandra	520	38.8	+ 2.9	57.0	21.7	0.95	9	+ 0.30	0.31	21	110.8
Taieri	80	42.8	+ 1.8	59.9	23.2	2.37	19	+ 0.24	0.64	21	
Invercargill ..	32	42.0	+ 1.3	56.0	25.0	3.05	19	+ 0.05	0.60	4	101.4

REDUCING LOSSES OF LAMBS IN SPRING

EVERY sheep farmer loses at least a few lambs each season. Prevention of all losses is impossible, but a knowledge of the nature and cause of the main troubles affecting lambs will assist in cutting losses to a minimum. In this article G. A. Thomson, Veterinarian, Department of Agriculture, Invercargill, deals with complaints which may affect lambs in spring and suggests how the various troubles may be dealt with or averted.

[*Department of Internal Affairs photo.*

In moving the flock during the lambing period care should be taken to avoid undue disturbance, which may result in separation of lambs from the ewes.

IF lambs lost at birth could be saved, it would often make an appreciable difference to the total reared. Some lambs are born dead because of rough handling or faulty nutrition of the ewe during late pregnancy, while ewes which are suffering from pregnancy toxaemia often produce dead lambs. Better feeding and management of the ewe flock during the latter part of pregnancy would mean more lambs and more ewes to rear them. Feed itself may sometimes cause abortion in ewes or birth of dead lambs at the normal time; prolonged feeding on chou moellier and similar crops, especially when second growth commences, is believed to cause such losses.

Many healthy lambs may die at birth because the ewe has difficulty in lambing. Thorough shepherding and cleanliness and common sense when assisting a ewe might save many lambs which are now lost.

Chills of New-born Lambs

A lamb needs to suckle as soon after birth as it is able to stand and to find its mother's teat. Its stomach is empty and its supply of energy rapidly diminishes if no nourishment is available, particularly when weather conditions are unfavourable. A dry lamb can conserve its body heat fairly well even when standing on snow-covered ground, but a wet lamb rapidly loses its energy under wintry conditions. The time-honoured customs of taking lambs in beside the kitchen fire, putting them in the oven (with the door open), or even of giving the lamb a hot bath are reasonably effective if a feed of milk is provided in addition, but feeding them in the paddock with a small quantity of glucose in water and leaving them with the ewe seems even more effective. Glucose is rapidly absorbed and gives the necessary energy for exercise and suckling. Once the lamb dries out and gets its belly full it is relatively safe from all but the worst extremes of wintry weather. Many farmers now make a practice of carrying with them during lambing a feeding bottle containing glucose in warm water.

Too much disturbance of the flock during the lambing period either by shepherds or dogs may cause separation of lambs from the ewes. Though such accidents are usually rectified within a day or two, the lamb can receive a check which may have an effect on its subsequent growth and development. Disturbance can be reduced to a minimum by breaking the flock up into several portions before lambing, or, better still, by using a system of ram raddling at tupping time, to separate the flock according to the lambing period.

Foster Mothering

Difficulties are often experienced in getting a ewe which has lost her own lamb to foster an orphan or twin lamb. The provision of one or two small pens in each paddock where a ewe can be confined with the lamb saves the work of carting ewe and lamb to a pen in the orchard or yard. Some ewes readily accept a strange lamb and may safely be released within a day or two; others are stubborn and may refuse to accept the lamb, or even to let it suckle, despite the use of subterfuges such as tying the skin of the ewe's dead lamb on to the foster lamb. A recent suggestion to overcome difficulty in mothering is to rub aniseed on the ewe's nose and over the lamb. The strong odour overpowers the weaker individual smell of the lamb.

It must be emphasised that rearing pet lambs on the bottle for a long period is an uneconomic proposition, because the amount of milk used is of more value than the lamb reared. However, bottle feeding may be necessary for a day or two until a suitable foster mother can be found. Undiluted cow's milk is generally used, but 4 parts of milk diluted with one part of water or lime-water is better. Add a dessertspoon of sugar or glucose to each pint of the mixture and feed at body heat. During their first week lambs should be fed a little often—up to ¼ pint five or six times daily. Older lambs can be fed larger quantities less often.

Diseases Affecting Young Lambs

Infection through the navel cord: Until the navel cord dries up it is a potential avenue for the entry of bacteria into the body. Fortunately, trouble from this source is not common (except for odd cases of arthritis), but where it does occur it emphasises the necessity for providing clean pastures for lambing.

There was a case last season where several young lambs were sick or had died within a week or so after birth, and where post-mortem examination

CARE OF YOUNG LAMBS

Upper: Left—A lamb needs to suckle as soon after birth as it is able to stand and to find its mother's teat. Right—Sheep feeding on chou moellier. It is believed that prolonged feeding of pregnant ewes on chou moellier is sometimes responsible for abortion or birth of dead lambs. Middle: An example of good, clean lambing pasture. Lower: Rearing a lamb on the bottle. Bottle feeding is uneconomic for a long period, but may be necessary for a few days until a suitable foster mother can be found.

[Middle photograph by National Publicity Studios.

revealed multiple, pus-filled abscesses in the liver and throughout the carcass. It was obvious that infection had entered through the navel. Inquiry showed that in removing an old gorse hedge rough stumps had been left in the ground and much debris scattered about part of the lambing paddock. It was concluded that the infection was picked up from this portion of an otherwise clean paddock. Losses may be encountered when the young lambs are in contact with any similar source of infection about sheep yards, under old hedges or plantations, and, to a minor extent, in open paddocks which are generally heavily stocked.

Enterotoxaemia (pulpy kidney): On nearly all highly-improved sheep farms in New Zealand lambs are lost occasionally through enterotoxaemia, which occurs most commonly when lambs are from three to eight weeks old and is characterised by the sudden death of lambs in good condition—indeed, the best lambs in the flock. Sometimes infection can be recognised before death, the symptoms being inco-ordination of movement, but generally no symptoms are seen and the lambs are found dead. The disease is caused by the absorption from the bowel of toxins produced by a bacterial organism known as *Clostridium welchii*, type D. which is a common inhabitant of the bowel and probably of the soil. The exact sequence of events within the bowel which causes the organisms to produce the deadly toxins is not yet known, but the generally-accepted theory is that any nutritional condition which leads to sluggishness of the bowel stimulates the organisms or allows them to multiply rapidly and to produce toxins. The toxins, which are soon absorbed, travel in the blood to the heart and brain, where they exert their action.

The term "pulpy kidney" is derived from the fact that in affected lambs the kidneys disintegrate rapidly after death, more particularly in younger lambs.

Near the dead lamb there is often a deposit of soft droppings which differ from the formed pellets passed by normal lambs. At a post-mortem examination of a lamb the casual observer may notice nothing abnormal in the stomach and intestines except the presence of wool balls in the fourth stomach, and may attribute death to the wool balls, but these are very common in healthy lambs and should not be considered seriously.

Close examination will usually reveal the presence of scattered, pinpoint hemorrhages on the inner side of the wall of the first few feet of the small intestine beyond the fourth stomach. The only other finding in the abdominal cavity will be the characteristic condition of the kidneys. If the lamb has just died, the kidneys will be found to be slightly swollen and congested with blood. If examined about two hours after the death of the lamb, the kidneys will be soft and almost jelly-like in consistency underneath the covering capsule. Further examination will generally reveal the presence of straw-coloured fluid in the sac covering the heart, while the heart itself will show small hemorrhages under the covering membrane on both external and internal surfaces.

A mothering ewe tied to a stick instead of being dragged to a fence. The rope has a chain with a swivel.

Before the successful development of vaccination, preventive measures were designed largely to alter the condition of the lambs. When losses commenced the flock would be moved to poorer pastures or given a short period of relative starvation. This procedure can be fairly effective, but has the undesirable effect of checking the whole crop of lambs to save a few lambs. Another practice has been to tail lambs immediately there are losses, in the hope that the slight setback received in tailing will be enough to prevent further trouble.

Measures such as those mentioned are seldom entirely effective and may be largely offset by the check to the lamb crop in general. There is no doubt that vaccination is the safest procedure where losses are heavy enough to warrant the cost.

Some years ago research experiments showed that vaccination of ewes some time before lambing caused antibodies to be produced in the blood and passed into the milk. The suckling lamb received the antibodies in the milk, absorbed them from the intestine into its own blood, and was protected against the disease. As the lamb grew older the antibodies were gradually destroyed, but protection against the disease lasted for several weeks.

As a result of this successful experimentation thousands of ewes have been vaccinated each year on farms where losses had been severe. Not every lamb has been saved, but losses have been greatly reduced.

Farmers who have lost lambs from enterotoxaemia and who have not previously vaccinated their ewe flock should communicate with the nearest office of the Department of Agriculture regarding details of the methods of vaccination, cost of vaccine, etc.

Losses from enterotoxaemia occasionally occur in three- to four-months-old lambs, in hoggets, and in older sheep on winter feed. Such losses can be prevented by vaccination before the period of susceptibility.

Arthritis: Arthritis—inflammation of a joint cavity—can be caused by direct injury to the part, but in lambs is almost invariably caused by infection with one or other of several bacterial organisms. There are two special periods during which trouble is likely to be observed, and these are related to the times of greatest opportunity for the bacteria to enter the body. The first period is soon after birth, when bacteria may come in contact with the undried navel cord of a very young lamb and travel through the blood stream to any of the joints; the second is at docking, earmarking, and castration, when bacteria may enter any of the wounds.

There are two more or less distinct forms of arthritis, "suppurative" and "non-suppurative." In the former the joint capsules become distended with pus, sometimes to such an extent that the capsule ruptures and forms an open wound, discharging pus. Lameness is acute, and the affected lamb may die or continue in a chronic state over a long period, remaining stunted and in poor condition. The organism usually causing this form of arthritis is the most common pus-forming bacteria, "staphylococcus," which is universally present and which is responsible for boils and septic wounds in humans.

Though treatment of cases of suppurative arthritis may be attempted by opening up the abscesses, it is difficult to attain success, so that prevention of the trouble, by lambing on clean pastures and carrying out tailing and marking operations hygienically, should be the aim.

Non-suppurative arthritis is much more prevalent throughout New Zealand than suppurative arthritis. It is a specific disease, caused by the organism *Erysipelothrix rhusiopathiae*, and is known all over the world. In this type of arthritis there is less swelling of the affected joints than in the suppurative type. In fact, often no swelling can be detected in the early stages, and there is no rupture of the skin over the area or discharge of pus or fluid. Non-suppurative arthritis is seldom fatal, but frequently there is considerable loss of condition. Most lambs recover within a few weeks and may be left with no obvious effects of the disease. However, a proportion of those affected will have swollen and deformed joints and will take much longer to reach killing weight. The carcasses of these lambs are likely to be rejected from export and partially condemned, resulting in considerable loss both to the national economy and the food production effort.

Treatment of non-suppurative arthritis can be carried out successfully in most cases, if commenced sufficiently early, by the use of sulphanilamide in adequate dosage over a period of three or four days. The aim should be, however, to prevent the occurrence of the disease where possible by use of clean, fresh yards for marking, clean instruments, and adequate supplies of disinfectant. The use of the bloodless types of emasculator and searing iron is believed to reduce the risk of infection, but it should be remembered that the earmarker can be just as easily the source of infection. The cases which occur before marking, as in the suppurative type of arthritis, are attributed to infection of the navel cord soon after birth. Prevention of this form, apart from the use of clean paddocks, is impracticable on the average farm, but, particularly where a stud flock is concerned, the use of tincture of iodine as a dressing for the navel cord is advisable where serious trouble is expected.

Other troubles after marking: In addition to arthritis, there is always the possibility of actual losses after marking: Occasionally a lamb may be found dead within a few hours of marking, or, if severe weather has not hastened death, the morning after marking. Such losses are generally assumed to be due to shock. If the knife is used for tailing and even if the searing iron is incorrectly applied, there may be considerable loss of blood, and this, in conjunction with rough handling, may be sufficient to cause "surgical shock." Fortunately such cases are not common, but the fact remains that even apart from actual deaths, the more blood a lamb loses at marking time the more nutritional energy it must divert from growth and development to replacement of the blood loss.

Blood poisoning: Odd lambs sometimes found dead a few days after marking show typical signs of blood poisoning—darkened skin and rapid putrefaction. Little may be noticed until the lamb is opened up, when an area of inflammation and putrefaction is found. This happens occasionally where the bloodless type of emasculator has been used in a faulty manner, resulting in a break in the skin through which the blood poisoning germs could enter and lodge in the contents of the scrotum. Prevention by attention to correct adjustment and use of instruments and to hygiene is the only way to deal with such losses.

Tetanus: Occasional cases of tetanus which occur on some farms after marking are often not recognised as such by the farmer. Tetanus in sheep or lambs occurs in an acute form, characterised by stiffening of all the voluntary muscles. In the early stages an affected lamb stands with its legs well apart and the head and tail elevated. It soon loses its balance and falls over, lying on its side with the legs extended and the head thrown back. Stimulation by touch or sound causes a spasm of the muscles, resulting in extreme rigidity, which gradually relaxes, but only partially. Death usually occurs within a few days. Early treatment of tetanus may be effective. The tetanus germs do not usually pass into the body, but lodge in a deep wound or under a scab formed over a pus-filled wound, where the germs produce a toxin which is absorbed by the blood.

Suitable sites in which the tetanus germ may thrive are often produced by docking and castration operations. Where a lamb is found affected with tetanus and there is pus under the scab on the tail wound another half-inch of the tail should be removed, and an antiseptic dressing applied. Similar treatment of a castration wound is indicated if this appears infected. Once the infected area is removed the lamb has a chance of overcoming the effect of the toxin still circulating in its body.

Congenital diseases: Periodically in most flocks an abnormally-shaped lamb is born, usually dead. Such abnormalities are of passing interest only, but the occurrence of a large number of abnormalities at one time requires investigation. This condition is chorea. Lambs with this complaint are affected from birth with continual trembling of the whole body and particularly of the extremities. The head shakes to such an extent that the lamb has difficulty in suckling, while the hind quarters shake so much that the lamb can hardy walk, or even stand. The trouble is more pronounced when the lamb is moving than when it is still. Affected lambs rarely recover and those which survive remain stunted and in very poor condition.

Two outbreaks of this trouble have been seen in Southland and investigations have been carried out. So far no definite conclusions have been reached, though it is thought that copper deficiency has some connection with the disease.

Any similar occurrence, even if it affects only a few lambs in the flock, should be reported to the nearest office of the Department of Agriculture so that further investigation can be made.

Congenital goitre: More common than chorea, but still not widespread, is congenital goitre. This disease is easily diagnosed, but its occurrence outside known iodine-deficient areas is difficult to explain. Some affected lambs may be born dead, either prematurely or at the normal time, but the majority are born alive, but with very little vitality, and die soon after birth. In a proportion of those affected there is an obvious swelling in the throat region, which when exposed proves to be due to tremendous enlargement of the thyroid glands. These glands are normally about the size of a shilling and not much thicker, and lie just over and behind the larynx. In lambs affected with congenital goitre one or both glands may be enlarged to the size of a big duck egg.

In an outbreak some years ago about 20 per cent. of the lambs in one group of ewes were affected. Recurrence of the condition can easily be prevented by use of iodised licks, but it is desirable that outbreaks of the disease should be reported immediately so that further investigation can be made.

Malformations: Malformations such as extra legs, two heads, and similar irregularities are simply the result of an accidental mix-up of the primitive cells from which the unborn animal develops. However, when the same type of abnormality occurs in a comparatively large number of lambs born in a flock during one season it becomes evident that chance must be ruled out and that there is a definite cause. The circumstances in many of these cases point strongly to the possibility of the malformed lambs being thrown by a particular ram. Where that is the case the remedy is to cull the ram responsible.

* * *

BOOK REVIEW

"Micro-organisms and Human Affairs:" I. D. Blair

THIS attractively-presented book will provide useful reading to those interested in non-specialist aspects of health and disease in both humans and plants. The nature of some microscopic organisms is described, and the book features sections relating to microbe activity. All readers should derive benefit from the outline of type disease in humans, and primary producers can well consider the facts relating to foods (milk in particular) and disease. Fungus activity in relation to plant disease and soil organic matter is described, and practical instructions are given for those who seek measures for disease prevention in small orchards and flower and vegetable gardens.

Brief though it is, the chapter on living soil serves to show the extent to which soil fertility depends on organic matter and micro-organism action. The book is an adequate treatment in popular form of important matters which to the general reader are still locked in formidable scientific literature. As it is well illustrated, and includes some excellent original plates, the book should serve both as a teaching aid and as a source of information to general readers.

Simpson and Williams Ltd., Christchurch. 7s. 6d.

Controlling Fruit Pests and Diseases

By S. FREW, *Orchard Instructor, Blenheim.*

SPRAYING of fruit trees begins in September with the advent of warmer weather and the bursting of buds into growth. By that time the protective coverings of previous "dormant" sprays have been spent, the spores of fungus diseases are active, and insect pests are emerging from their winter quarters. Pruning, cultivation, and drainage assist to a limited extent in the control of disease, but in the main disease control depends on efficient spraying.

EFFICIENCY in spraying can be achieved only if these essential points are observed:—

1. **Application of sprays at the correct time and at sufficiently frequent intervals to ensure good coverage;**
2. **The use of reliable spray materials at the correct strength; and**
3. **Thoroughness of application.**

A complete spray programme for the control of the principal pests and diseases is set out in the accompanying table. With slight modifications to meet exceptional circumstances, it is applicable to all parts of New Zealand. The strengths recommended are for use with certified therapeutants.

Red Mite Infestation

In addition to the diseases and pests enumerated, red mite sometimes becomes troublesome during the summer. It can be destroyed by the application of summer oil 1-100, but, as the application of this material within 10 days of a sulphur spray is dangerous, it is difficult to fit in without interfering with the normal spray programme. Only in January, after the scheduled sprays have been completed, and if the danger of other diseases has receded, can red mite be controlled effectively and with safety. The most effective way of preventing red mite infestation is to destroy winter eggs with an application of winter oil in the dormant season.

The programme given for pears suits the majority of varieties which are susceptible to black spot infection. On the more tender varieties, which are not so tolerant of Bordeaux, the alternative lime sulphur programme, as for apples, should be adopted.

The lead arsenate spray recommended for stone fruits is suitable for cherries and plums, but peaches and nectarines are intolerant of arsenates, so control of insect pests on these varieties during the growing season can be assured only by summer oil-nicotine applications.

Brown Rot in Apricots

Brown rot, the principal disease of all stone fruits, can be controlled effectively only by applications of sulphur. Unfortunately, the effect of a sulphur spray on apricots is that invariably the fruit will drop within 10 days. Thus the only time when sulphur can be applied is within 10 days of harvesting.

This spraying is of great value, however, as the most severe infection of brown rot often occurs at that time. A similar spray applied just before picking ensures some protection from brown rot infection after harvesting and during transport to the market.

"Don'ts" for Spraying

Don't expect results if the work is not thoroughly done.

Don't think that a week earlier or later than the recommended time is just as good.

Don't overspray. A continuous even coating should be left on fruit and foliage. Material which runs off does no good.

Don't spray during excessively-hot weather; sun-scald might result.

Don't fail to clean the spray pump thoroughly after each spray. It saves much trouble when the time comes for the next application.

Don't think that spraying alone will ensure good fruit; pruning, cultivating, and thinning are also essential.

SPRAYING PROGRAMME

Time of Application.	Spray.	Disease or Pest.
	APPLES	
Early green tip	Bordeaux 5-4-50, or lime sulphur 1-30	Black spot, powdery mildew
Open cluster to pink	Lime sulphur 1-150	
Petal fall	Combination spray of lime sulphur 1-200, colloidal sulphur 2lb. to 100 gallons, lead arsenate 1½lb. to 100 gallons, and hydrated lime 3lb. to 100 gallons	Black spot, powdery mildew, codling moth, bronze beetle, leaf-roller caterpillar
10 to 14 days later		
14- to 18-day intervals until the end of January, or later if required		
When leaf hopper is in evidence	Nicotine sulphate 1-800, combined with the above spray	Leaf hopper
	PEARS	
Early green tip	Bordeaux 5-4-50	Black spot
Open cluster to pink	Bordeaux 3-4-50	Black spot
Petal fall	Bordeaux 3-4-50 plus lead arsenate 1½lb.-100 gallons	Black spot, codling moth
14 days after petal fall		Black spot, codling moth
18- to 21-day intervals until January-February		Black spot, codling moth, leaf-roller, pear slug
	STONE FRUIT (excluding apricots)	
Bud movement	Bordeaux 5-4-50	Leaf curl, shot-hole
Pink	Lime sulphur 1-150 plus colloidal sulphur 2lb. to 100 gallons	Brown rot, leaf curl, shot-hole
14 days after petal fall		
21-day intervals		
Mid-January	Summer oil 1-100, plus nicotine 1-800	Red mite, black and green aphis
When cherry slug appears	Basic lead arsenate 1½lb. to 100 gallons	Cherry slug and leaf-roller caterpillar
	APRICOTS	
Bud movement	Bordeaux 5-4-50	Leaf curl, shot-hole
Pink	Bordeaux 3-4-50	
14 days after petal fall	Bordeaux 3-4-50 plus lead arsenate 1½lb. to 100 gallons	Leaf curl, shot-hole, leaf-roller caterpillar
7 days before harvesting	Colloidal sulphur 6lb. to 100 gallons	Brown rot
Just before picking		

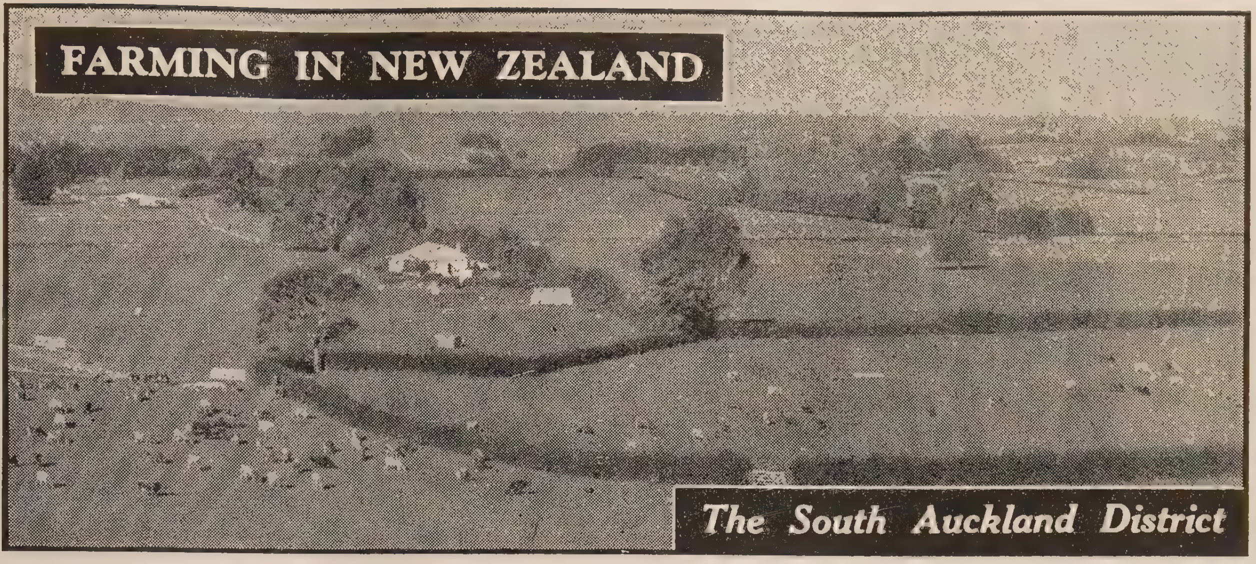
FARMING IN SOUTH AUCKLAND

The South Auckland district, which ranges from Auckland City in the north to the Bay of Plenty in the east and to the King Country in the south, encompasses a wide variety of types of farming. The Waikato is noted for its dairy and fat lamb production, and the pumice country in the Rotorua and Tauranga areas has excellent prospects of still greater development for both sheep and cattle farming.

[Top photograph by R. Steele and middle right and bottom photographs by National Publicity Studios.

FARMING IN NEW ZEALAND

The South Auckland District



[*National Publicity Studios photo.*

BETWEEN Auckland City and the southern boundary of Auckland Province lies an extensive tract of farmland which plays an important part in the agricultural economy of New Zealand. From this area, which is not highly endowed with natural soil fertility, come fully two-fifths of the Dominion's dairy products, nearly half of its pig meats, a quarter of its beef, and an important quota of its fat lamb and wool. Non-agricultural products such as coal, gold, and timber add to the wealth drawn from the land. This relatively-high production comes from some 5¾ million acres of occupied land, of which 3 million are in grass, 1½ million are unimproved, more than 600,000 acres are in planted forest, and the balance in market gardens, orchards, and vineyards. Thus, only one-eighth of the Dominion's occupied land, with about one-sixth of its grassland, is responsible for a large share of the country's primary production. This review of the production and potentialities of the district by C. Walker, Assistant Fields Superintendent, Palmerston North, will be concluded in next month's "Journal."

APART from a few areas of very limited size, the land is of comparatively low fertility, so high production must be the result of other factors such as climate and the exploitation of aids to farming practices. For the purposes of this survey the region has been divided into five zones consisting of blocks of country with certain common features of soils, topography, or climate, though in such an area definite lines of cleavage are difficult to fix.

South Auckland

Consisting of the counties of Manukau, Franklin, and Raglan, the South Auckland area lies immediately to the south of Auckland City and extends down the west coast to Raglan County's southern boundary. It is composed for the most part of steep, greywacke hills on the north-east, with flat alluvial country dotted by basic volcanic cones in the middle district from the city south to Pukekohe; this gives way to coastal sand in the north-west and to a volcanic plateau a little further south, with hills of claystone, limestone, and sandstone on the southern boundary. In general the climate is temperate and warm, with westerly winds prevailing, and the average annual rainfall of 45 to 50in. is well spread throughout the year.

The alluvial soils and low basic volcanic cones of the middle region are quite fertile and easily cultivated. With their favourable frost-free climate and proximity to the city of Auckland, they are well situated for the production of vegetables, early potatoes, onions, poultry products, and milk for town supply. These activities have been fully developed in favoured localities such as Pukekohe, where about 4000 acres are used annually for market gardening and potato production. However, such cropping is by no means the sole farming occupation on these soils, as dairying is also important, either for factory or town supply, and fat lamb production is gaining in popularity.

On the steeper country to the east and down the west coast through Raglan sheep and cattle are run chiefly as breeding flocks and herds for stocking the easier and more fertile lowlands of the Waikato. Fertility and carrying capacity are fairly low, especially where topdressing is not regular or practicable. This country has a fairly-high rainfall which induces a regeneration of second growth as pastures weaken. Plants like piripiri, bracken, hard fern, tutu, and manuka come in fairly rapidly and necessitate clearing by fire, followed by resowing; this treatment is merely a palliative and, if applied alone, requires to be repeated every few years. The efficient handling of this country depends on subdivision, introduction of clover and better grasses, manuring, and stocking.

At present subdivision is difficult, wire and fencing timber being scarce and expensive, but much can be accomplished by the intelligent use of existing fencing to introduce a measure of rotational grazing, which will act favourably on pastures and provide opportunities of handling second growth. Set stocking is of no assistance in this respect and usually leads to pasture deterioration.

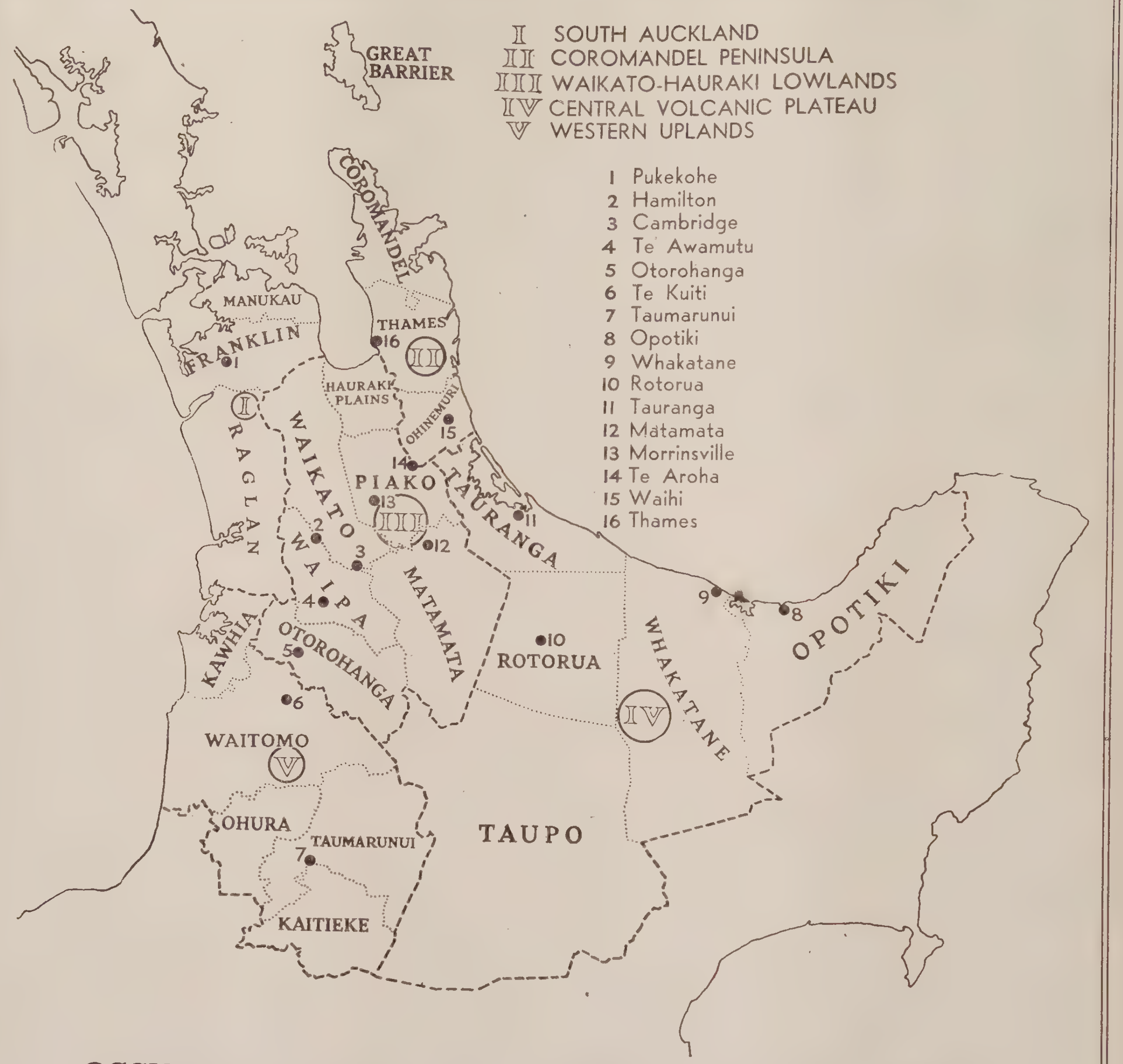
With good use of subdivision must go an appreciation of the fact that on all this poorer hill country the first essential to higher production is the introduction of a suitable clover to the sward. On the wetter and shaded slopes *Lotus major* should be the pioneer, and on other areas subterranean clover plays a useful part. If some phosphate topdressing can be applied, clover establishment will be more rapid and improvement in grass species will be accelerated.

Such improvement will then make possible the increase of stock-carrying capacity which is all-important in building up production on such land. Where second growth is troublesome it will be essential to increase the proportion of cattle to control it adequately. Sheep are poorly equipped for this purpose and only by using the heavier animals can the land be kept reasonably clean.

Waikato-Hauraki Lowlands

Counties included in the Waikato-Hauraki lowlands area are Waikato,

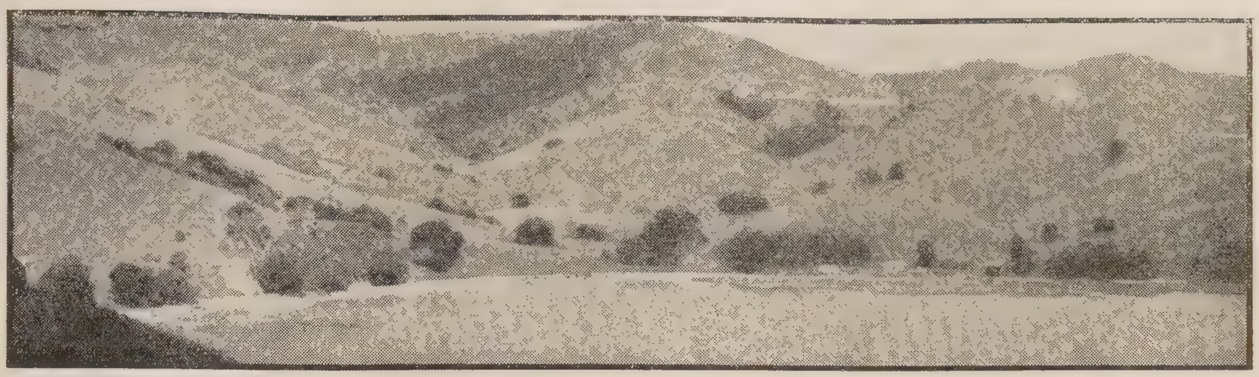
THE FARMING DISTRICTS OF SOUTH AUCKLAND


I SOUTH AUCKLAND
II COROMANDEL PENINSULA
III WAIKATO-HAURAKI LOWLANDS
IV CENTRAL VOLCANIC PLATEAU
V WESTERN UPLANDS
1 Pukekohe
2 Hamilton
3 Cambridge
4 Te Awamutu
5 Otorohanga
6 Te Kuiti
7 Taumarunui
8 Opotiki
9 Whakatane
10 Rotorua
11 Tauranga
12 Matamata
13 Morrinsville
14 Te Aroha
15 Waihi
16 Thames
GREAT BARRIER
COROMANDEL
MANUKAU
FRANKLIN
THAMES
HAURAKI PLAINS
OHINEMURI
RAGLAN
WAIKATO
WAIPA
PIAKO
TAURANGA
MATAMATA
KAWHIA
OTOROHANGA
ROTORUA
WHAKATANE
OPOTIKI
WAITOMO
OHURA
TAUMARUNUI
KAITIEKE
TAUPO

OCCUPATION AND DEVELOPMENT OF LAND, 1920-45

	Area occupied (thousands of acres)		Sown grass (thousands of acres)		Sheep shorn (thousands)		Breeding ewes (thousands)		Dairy cows (thousands)		Total cattle (thousands)		* Fertiliser used (tons)
	1920	1945	1920	1945	1920	1945	1920	1945	1920	1945	1920	1945	1945
South Auckland	880	900	560	660	350	820	120	570	47	140	160	290	15,000
Waikato-Hauraki lowlands	1,600	1,570	820	1,060	190	1,150	120	910	205	385	375	675	100,000
Coromandel Peninsula ..	450	470	140	180	51	127	33	66	18	39	42	78	5,000
Central volcanic plateau	1,205	1,655	448	526	253	434	134	344	46	136	138	262	39,000
Western uplands	1,234	1,180	709	717	550	1,140	295	692	35	24	150	193	20,000
Totals	5,369	5,775	2,677	3,143	1,394	3,671	702	2,582	351	724	865	1,498	179,000

* Quantity delivered to officered railway stations, not including shipments by sea or direct by road transport.



The land around Kereta Bay is typical of the Coromandel Peninsula hill country.

Hauraki Plains, Piako, Matamata, Waipa, and Otorohanga. In the main it consists of two extensive basins—the Hamilton, formed by the Waikato and Waipa Rivers, and the Hauraki, formed by the Piako and Waihou Rivers—separated by a low range of hills. In the south Matamata County rises on to the central pumice plateau, and the northern portion of this region is partially divided by hills extending from Taupiri to the Firth of Thames.

On the whole the land consists of low, easy, undulating hills rising from flat alluvial land and extensive peat swamps. Much of the alluvial land has been built up from water-borne pumice and consequently is fairly well drained. The undulating hills are chiefly of clayey consistency, reasonably free draining, and providing fertile areas for cropping and pasture production.

In small areas throughout the Hamilton Basin and more extensively in the northern Hauraki Basin are tracts of meadow soils which are particularly fertile and provide very high summer production. However, drainage is poor and, because of their lack of fall, they are particularly wet in winter and early spring. These soils present a serious drainage problem, especially on the Hauraki Plains, where outlet drains are affected by tides, and until some relief can be provided by special water-disposal facilities production and winter usage will be restricted.

Much of the large blocks of peat swamp is very deep. Where the peat fringes the surrounding undulating to flat lands and is of moderate depth it can be brought into production by judicious draining, followed by pasture establishment. On this country the aim should be to drain very gradually, deepening the drains as the country settles. In the past many main outlets were put in to their final depth, with the result that full decomposition of the peat was arrested rather than accelerated. If such species as Yorkshire fog and *Lotus major* are established on partially-drained peat, cattle can be used to bring about consolidation, which enables the areas to be ploughed and sown in permanent pastures. In some localities bands of undecomposed peat can provide difficulties in pasture establishment, as they will not weather freely and they affect the movement of soil moisture. In such cases some judicious burning of the top furrow will improve the prospects of providing a good seed-bed, but care should be taken to burn when the subsoil is fairly moist.

In general, the Waikato-Hauraki lowlands enjoy a mild climate with an annual rainfall of 45 to 50in. In southern and central districts frosts of varying intensity are experienced in winter, but from spring to autumn the weather generally is warm and dependable. With the rainfall well distributed, conditions are particularly favourable for pasture production.

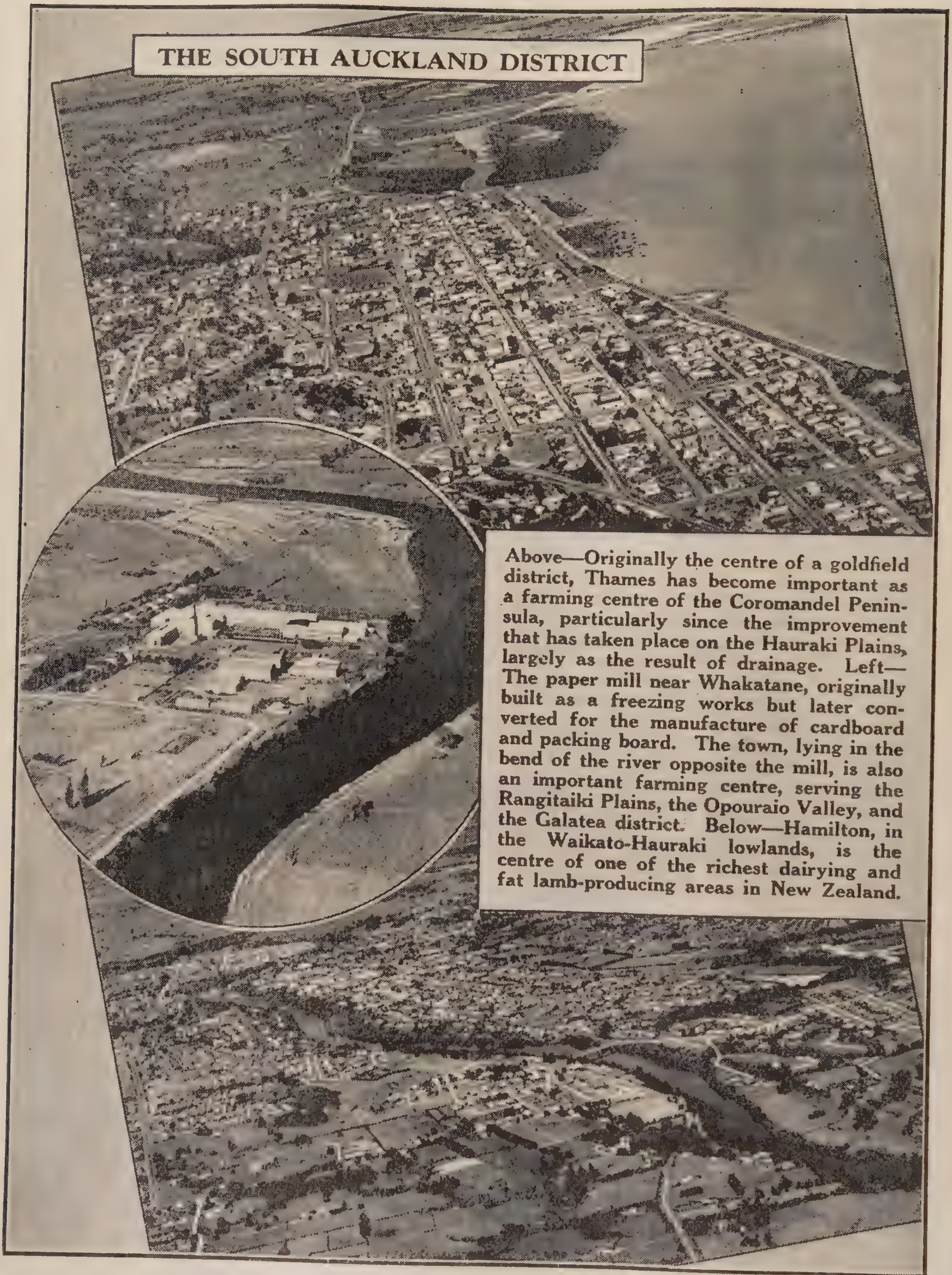
It can be claimed that this area was the nursery for grassland research and for the development of pasture production throughout most of the North Island to its present high level. In the early days of settlement cropping with wheat and oats and with fodder crops to supplement grass was an important part of agriculture. At that time pastures were poor and frequently ran to sweet vernal, fog, and flat weeds a few years after being sown down. Later, with the introduction of topdressing, it was found that not only did the swards improve in quality but they produced for much longer periods of the year—in fact, it was found that crops could be dispensed with almost entirely. That gave rise to the era of all-grass farming.

With this development of pastures came changes in production. Grain crops, store and fat cattle, and sheep gradually gave place to dairy herds and the production of pig meats, which in turn are being replaced by the production of fat lambs and "baby" beef. In general the area is concerned with dairy production, for which it is the outstanding district in the Dominion. However, it also carries 750,000 other cattle and more than 3½ million sheep, 2½ million being breeding ewes.

Fat lamb production is of special and increasing importance. It has been the practice to buy in old ewes from other districts in the autumn, take a lamb, and sell both ewe and lamb fat. Occasionally the ewes were carried over to produce a second lamb before they were disposed of. As a modification of this practice, farmers buy in store lambs from hill country

Maori land development at Horohoro, Rotorua.

THE SOUTH AUCKLAND DISTRICT



Above—Originally the centre of a goldfield district, Thames has become important as a farming centre of the Coromandel Peninsula, particularly since the improvement that has taken place on the Hauraki Plains, largely as the result of drainage. Left—The paper mill near Whakatane, originally built as a freezing works but later converted for the manufacture of cardboard and packing board. The town, lying in the bend of the river opposite the mill, is also an important farming centre, serving the Rangitaiki Plains, the Opouraio Valley, and the Galatea district. Below—Hamilton, in the Waikato-Hauraki lowlands, is the centre of one of the richest dairying and fat lamb-producing areas in New Zealand.

[*V. C. Browne photos.*

in the late summer or early autumn and fatten them on surplus grass or crops grown for the purpose. In recent years the two-tooth ewe has replaced the older ewe to some extent, but most farmers still prefer the older animal, especially when good-framed stock from east coast districts is available.

Fat lamb production is restricted mainly to the undulating hill country and the well-drained flats; on the meadow soils, particularly those of the Hauraki lowlands, and on the peat soils dairying is the principal activity.

Coromandel Peninsula

Including Coromandel, Thames, Ohinemuri, and Great Barrier Counties, the Coromandel Peninsula zone for the greater part consists of a steep mountain range running north and south, rising to 3000ft. in parts, and extending beyond the mainland again to form the island county of Great Barrier. Most of the country is rugged and unsuited for farming, but there are small areas of easy country on both coasts, more especially at Coromandel, Colville, Whitianga, and south to Waihi. None of these is particularly fertile, but with topdressing they can be made reasonably productive.

Extending from Thames to Te Aroha on the west is a tract of easy country ranging from river silts to peat and merging into undulating hills of fair quality. East of the main range and surrounding the township of Waihi is a pumice plain that has dedeveloped into good pasture land. The climate is very favourable for all agricultural activities. Frosts are rare and light, conditions are mild to warm, and the rainfall of 50in. (85in. at Waihi) is very well distributed.

Because of the ruggedness of most of the country north of Thames, pastures are poor and difficult to maintain. Transport facilities are also poor, irregular, and expensive. For instance, Great Barrier depends on a boat service of limited capacity, and the mainland is served by rail only as far as the townships of Thames and Waihi. With high cartage costs both for inward commodities and for outward products, coupled with the fact that the greater part of Great Barrier, Coromandel, and Thames Counties is of very low fertility, the use of fertiliser and the development of pastures are very restricted. Apart from favoured pockets in these counties, farming is limited to the running of breeding ewes and wethers with a small proportion of cattle. A little dairying is carried on where the land permits, but it is not of great importance.

From Thames to Te Aroha, however, dairying and fat lamb production are very well developed, with dairying occupying most attention at present. In the Waihi district dairying has also developed considerably, with fat lamb and beef production gaining in popularity on the undulating to hilly coastal areas.

Central Volcanic Plateau

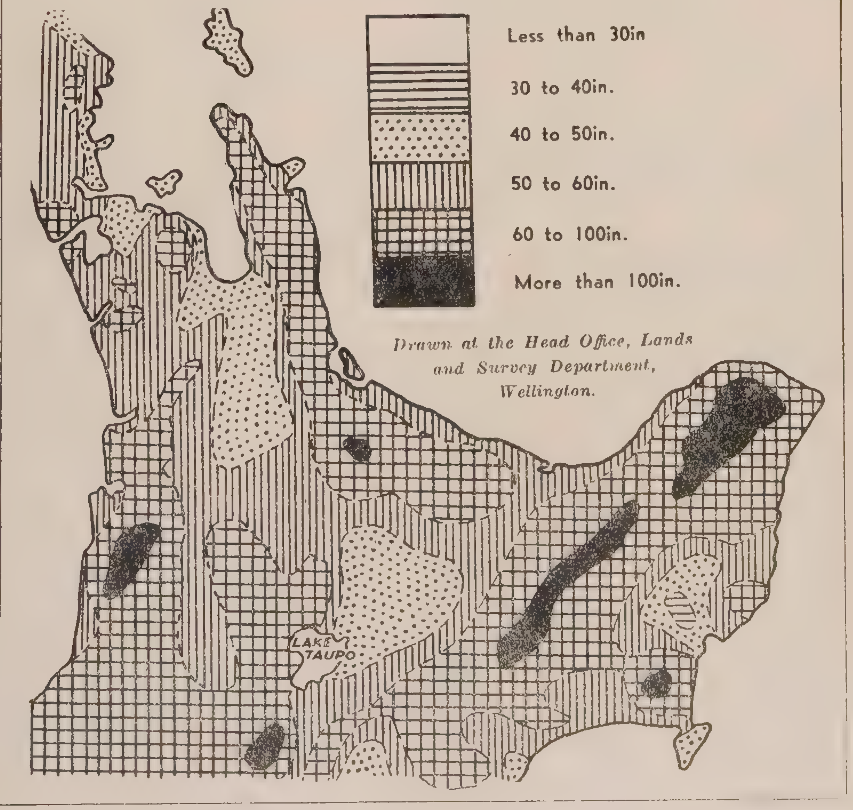
Covering the counties of Tauranga, Whakatane, Opotiki, Rotorua, and Taupo, the central volcanic plateau ranges from the Bay of Plenty in the north to the southern boundary of the province and from the main divide in the east to the National Park area in the west. The soils of this region have been built up from successive pumice ash showers. From Rotorua southward it consists of a pumice plateau at an elevation of 2000ft., most of it flat over wide areas, with isolated volcanic cones rising from this level. North of Rotorua the country falls somewhat steeply to the coast and is deeply dissected by gullies and gorges until it finally merges into easy rolling country, which gives way to a narrow coastal plain of sand, silts, peat, and alluvial swamps, separated from the sea by a narrow strip of coastal sand in varying stages of consolidation. East and south of Opotiki township the country rises steeply, where the mudstone and papa hills are subject to erosion and reversion.

The pumice soils which form by far the greater part of this region are of very low natural fertility, and formerly their suitability for pastoral farming depended a great deal on the origin of the ash showers from which they were formed. Some of those showers were very deficient in cobalt, and though they could be induced to grow grass well, stock became unthrifty and would waste away unless given a change on to other country. Fortunately with the development of cobaltised topdressing affected country can now be farmed successfully.

In recent years development of the pumice lands has been receiving a great deal of attention. The natural tussock herbage of this country, after it was burnt, was replaced chiefly by manuka and manoao scrub on the flats and by bracken fern and tutu on the warm hillsides. That led many people to regard these soils as unattractive for farming, but it has been amply demonstrated that sound preparation, the sowing of good seed, and fertilising will produce excellent results. Because of its elevation this country is subject to severe winds and heavy frosts even in early autumn, so one of the first requirements in developing such land is the provision of shelter. Fortunately trees grow rapidly, and belts of *Pinus radiata* supply protection within five to ten years of planting.

The development of pumice land, after the natural cover has been removed by cutting and firing, consists of full cultivation, good consolidation, sowing of good seed, and adequate manuring. As seed may have to be sown in southern districts in late spring to avoid autumn frosts, cultivation should be started early enough to allow ample time for the work. Generally, this should consist of ploughing with a mouldboard plough, followed by a rolling on the furrow before any other work is done to repack the soil and eliminate air pockets. Then the land requires discing and harrowing to make a fine, deep bed, after which it should be rolled again for firmness. Seed and fertiliser at 3cwt. of phosphate per acre should next be sown, after which the land should be brush harrowed to cover the seed and rolled to bring moisture to the surface and assist

ANNUAL RAINFALL OF SOUTH AUCKLAND



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Under low fertility without topdressing, the pumice country of the central plateau will not carry a good sward and rapidly reverts to scrub.

germination. The first grazing should be light, taken by young stock if available, and in the spring following the sowing of the pasture a further 2 to 3cwt. of phosphate an acre should be sown; this will be especially valuable in encouraging clover establishment. From this stage 3cwt. an acre of fertiliser applied in autumn will suffice. Lime has not generally been found necessary on pumice country.

The easier coastal country, including the undulating lands and peat or alluvial soils, is similar to that described for other districts. It is easy to develop and carries good pastures.

In many respects the hill country in the Opotiki area is subject to the same problems as that of Raglan County and they can be met in the same way.

Production on this land is variable. On the higher southern plateau fairly-extensive areas have been planted in pine forest. Where pastures have been developed dairying is practised, and to some extent sheep farming. At present more attention is being paid to fat lamb production, but it is not yet at a stage where it can be regarded as important. Climate can be fairly rigorous, with very cold winds, heavy frosts, and occasional snow.

North of Rotorua the climate becomes much milder, and along the coast it is warm and almost frost free for most of the year. The rainfall of 50in. is very well spread, so that growth is maintained into the summer. Pasture production is abundant and particularly suitable for the exploitation of paspalum in grass mixtures. For summer and early-autumn production this grass is pre-eminent; it will produce as much then as ryegrass will in spring and early summer, and as it produces high-grade milk, free from taint, it has a special place on all dairy farms. Paspalum is a particularly-vigorous grass which frequently requires resort to the mower to keep it within reasonable limits of growth. If that is done and fertility is maintained by topdressing, there is little danger of its affecting other species adversely.

Dairying has been the dominant farming activity for many years. Associated with it has been some maize growing on the flats, sheep and cattle farming for breeding on the steeper lands, and citrus growing near Tauranga. At one time maize was often grown in the Bay of Plenty as the pioneer crop to prepare the land for grassing. However, grassland farming now appears to offer a more secure livelihood, while breaking up pasture for maize entails resowing to grass at fairly-heavy cost. As in other districts, there has been a trend in recent years toward fat lamb production, especially in Tauranga County, where, with the curing of bush sickness by cobalt manuring, the numbers of sheep have risen from 18,000 in 1925 to 185,000 in 1945. Figures for breeding ewes for the two periods were 6000 and 133,000.

Western Uplands

The counties included in the western uplands are Waitomo, Ohura, Kaitieke, Taumarunui, and Kawhia. To the east the land of this region is covered by pumice ash from the Taupo shower and in the south by a similar deposit from the Ngauruhoe shower. In the west it consists of a broad, deeply-dissected plateau on beds of greywacke, conglomerate, sandstone, and limestone. Some of the limestone appearing as outcrops in the Te Kuiti district is worked commercially for the production of lime. The summer climate is fairly good, but winters can be cold, with frosts and snow. Rainfall varies between 50 and 100in. a year.

In general the land is poor and pasture runs out fairly rapidly unless topdressed. With the high rainfall reversion to second growth is rapid and difficult to contend with. As in South Auckland, handling of this problem depends on building up the sward by subdivision, clover introduction, manuring, and stocking with cattle. Firing alone is often practised, but it cannot lead to a permanent solution.

Throughout this region the production of store sheep, wool, and, to some extent, store cattle is the principal activity. Most of such surplus stock finds a ready market among buyers from the easier country of the Waikato and Taranaki. In favoured localities dairying and fat lamb production are also carried on, but they are relatively unimportant.

Hard fern showing prominently on sheep country near Taumarunui.

RUAKURA RESEARCH SHOWS HOW TO

By C. P. McMEEKAN,
Superintendent, Ruakura Animal Research Station.

WITH the new dairying season approaching, the successful rearing of dairy stock should be one of the matters exercising the minds of progressive dairymen. In this connection the experiments of the Department of Agriculture's Animal Research Station at Ruakura on grazing management in relation to the growth and thrift of the future dairy herd have some valuable lessons.

SOME eight years ago there began at the station a series of studies which, though incomplete, have already yielded some of the most reliable, best-authenticated experimental results on animals that have ever been reported in New Zealand. Year after year the benefits of rotational grazing management as compared with the common method of set-stocking in the rearing of dairy calves have been so clear cut and consistent that no doubts can exist as to the reliability of the method.

The Calf and Weaner Stage

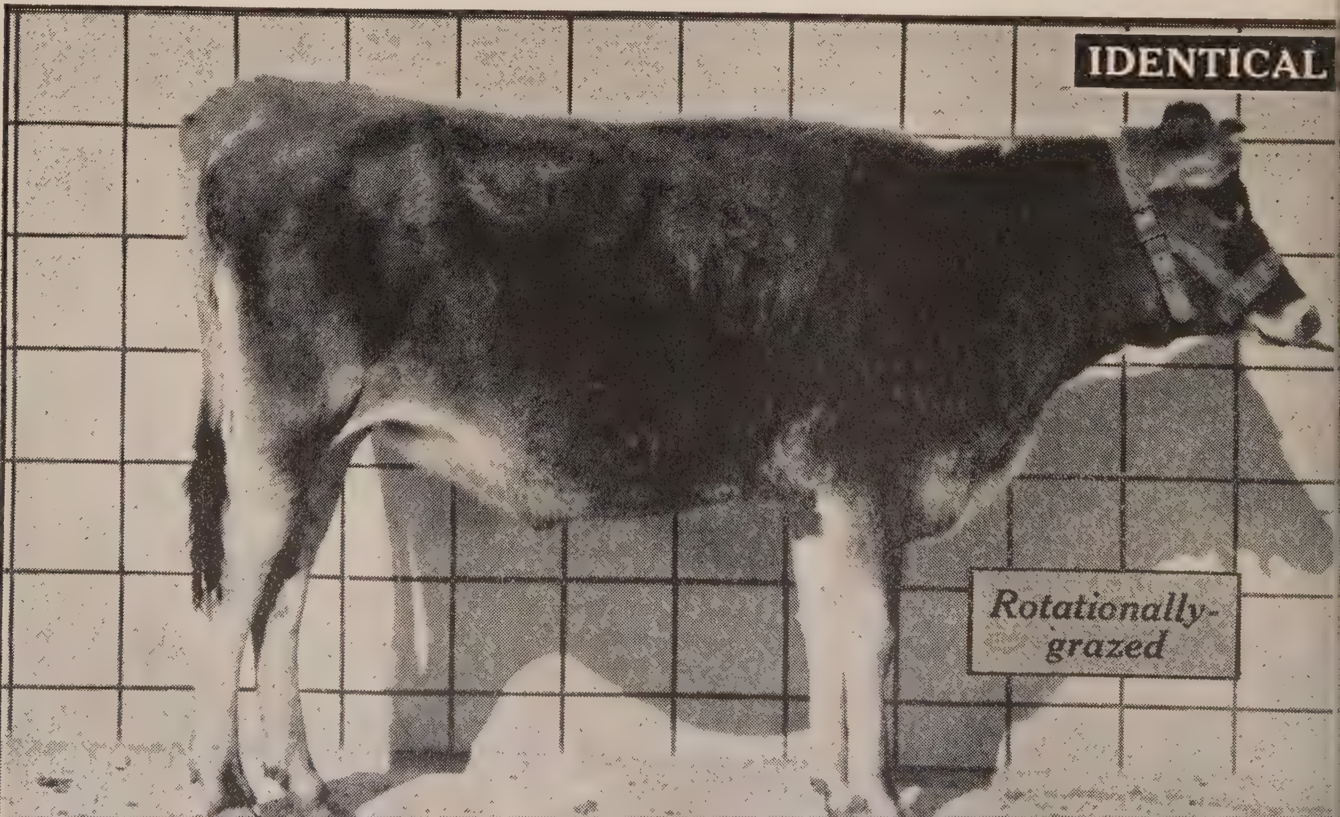
The story of these results has been told on several occasions in the "Journal." Results presented have shown quite clearly that calves moved frequently around pastures normally grazed only by the milking herd suffer no mortality from internal parasites during their first winter, enter the winter from 70lb. to 100lb. heavier than their comparable set-stocked mates, and do not require drenching at any time against worms. In contrast, set-stocked animals are not only smaller, with less bone development and body weight, but are subject to high mortality rates in autumn and early winter, if the conditions of set-stocking are at all severe. Such calves, even under less severe conditions, require regular drenching with phenothiazine against worms if thrift is to be maintained and mortality rate is to be kept at a reasonably low level.

There should be little need to stress further the significance of these findings, particularly as farmers who have been experiencing trouble from calf losses and lack of general thrift after weaning and during the early winter have found that such troubles disappear if a rotational system of grazing management is conscientiously practised. Indeed it is more than pleasing to the research workers concerned to note the favourable reception the method has had from hard-headed farmers from whom they are more accustomed to receive criticism than praise.

It is also clear, however, that many farmers who are not rearing good calves still persist with a set-stocking technique and it is equally noticeable that many apparent failures of the rotational methods are reported. From time to time farmers inform research workers at Ruakura of continued losses, lack of thrift, a high incidence of scouring in autumn, and a need to drench calves that "have been managed on the rotational plan." It therefore seems worth while to stress once again the essential features of the system and to point to weaknesses that have been noticed in field applications of the method. From experience at Ruakura the following appear to be the essentials for the development of well-grown weaners:—

1. **Rotation around the same pastures as used by the milking herd before grazing by the herd.**
2. **Regular and frequent shifts, preferably every one to two days.**
3. **Commencement of rotation from an early age—at least by the time the calves are a month old.**

At Ruakura the dairy herd is so managed that the herd remains in one field for one to two days, or an average of three milkings per paddock at each grazing period. The calves precede the cows round the same fields, going into each paddock for the same length of time as the herd, but approximately midway between successive cow grazings. By this time a good recovery of grass growth has occurred and ample fresh feed is available for their use. The calves may thus be considered as preceding or following the herd, depending on the point of view. The important thing is that the shift is regular and on to good-quality dairy pasture. If they precede the herd by too long a period, they follow the herd too closely and results will be poor. If farmers confine rotation of calves to a limited area of the farm, thus retaining the best pastures for the milking herd, results will likewise be poor. If the interval between



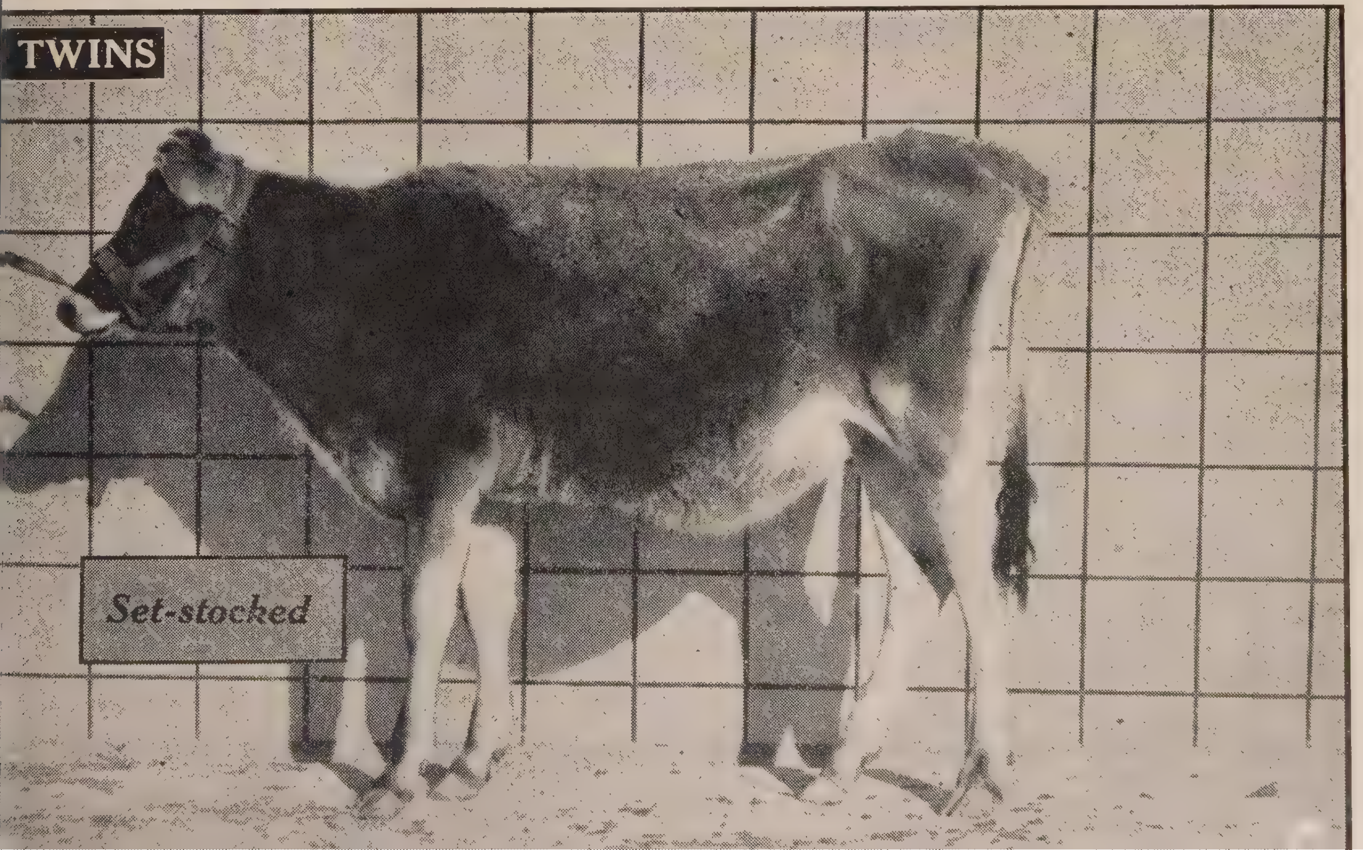
REAR WELL-GROWN DAIRY HEIFERS

shifts is too long—the temptation to leave the animals in the same field for a week or more is sometimes irresistible if there is apparently "ample feed" in the paddock concerned—the results will be poor. Finally, if calves are reared in a calf paddock and rotational management does not commence until after weaning, results will be poor relative to those obtained from an earlier start.

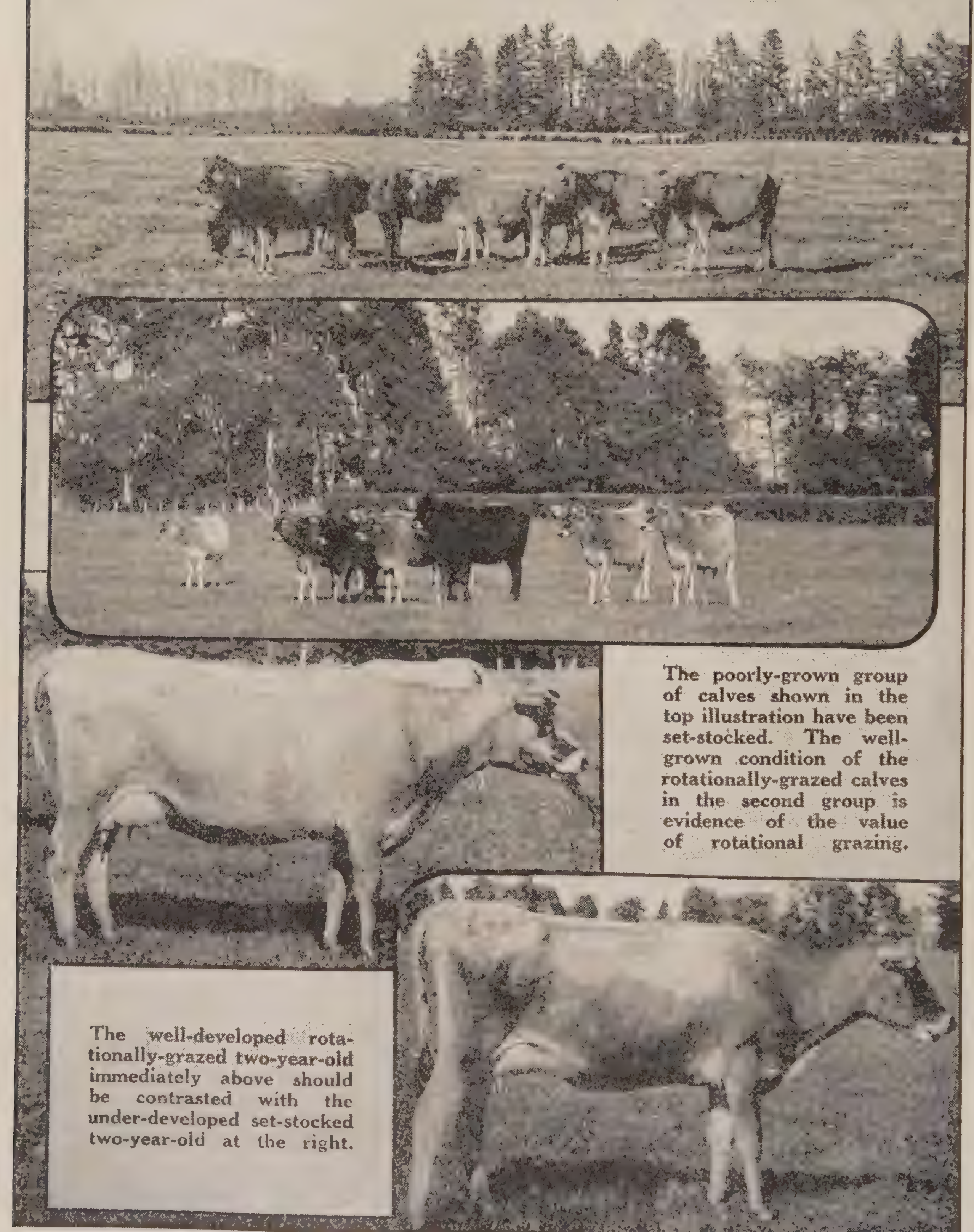
Failure to use dairy cow pastures is perhaps the greatest weakness in the field. Farmers are often afraid that by so doing they are depriving the milking cows of feed and in consequence a loss of butterfat will ensue. On the old principle of a bird in the hand being worth two in the bush, future herd profits are accordingly sacrificed for immediate returns. But is this argument necessarily sound? Experience at Ruakura suggests it is not. The best illustration that can be given in this connection is the performance of the Ruakura No. 1 Dairy Herd during the past season. On approximately 140 acres 126 cows produced an average of 351lb. butterfat per cow—over 44,000lb. of fat, or more than 300lb. of fat per acre. The same area reared 110 calves which were grazed on the rotational plan ahead of the cows from one month of age—four times as many calves as are needed for annual herd replacements. At the same time over 40 in-calf heifers were used as "followers" during most of the season. These figures are mentioned to emphasise that though calves do eat grass when offered suitable feed, they do not necessarily penalise herd production by so doing. If the competition from the calves had been of any moment, particularly considering the drought conditions of the Waikato last year, farming four times the normal number in this way would hardly have been associated with such a good herd average. The reason for this apparent anomaly is probably quite simple. Careful observations show that calves are particularly selective grazers and are extremely fussy about their food. If they are left in a calf paddock or in a single field too long, they rapidly remove the grass they like, and thereafter graze only a little, though ample feed still remains. Thus they derive practically no benefit from pasture. Under a constant-movement system on good cow feed they are offered a fresh selection each day or so, and in consequence consume sufficient grass to be of benefit to them. At the same time they affect the gross bulk of feed only a little, leaving untouched much material quite acceptable to the older animal.

This emphasis on rotation over "good pastures" as an essential means that some measure of judgment and common sense is required. Though in a good grass year the system is practically fool-proof, additional precautions are required in a drought period followed by lush, quickly-growing pasture. When grass is in very short supply in a dry season the supplementary feeding of silage each day is a distinct advantage, though rotation is still essential. Hay should be offered under such conditions to get the animals accustomed to this fodder, which will be essential when rains come. Failure to appreciate this and to feed hay when growth of grass recommences has been responsible for much trouble during the past season. During this season there was a tendency to hold calves too long on dried-out summer pastures with no supplementary feed, and when the rain occurred they were placed on the very lush pasture that grew. Scouring occurred and calves that had been doing well suffered severely. The feeding of hay to carry the calves on until all new growth is relatively mature is the best way of avoiding this breakdown.

A further defect noticeable on many farms is adherence to the practice of having a small calf paddock handy to the shed in which calves are kept until weaning. This field is usually carrying one of the poorest pastures on the property and is usually of a type that yields only a small supply of suitable calf food. Calves under such conditions are able to grow solely because of the milk they receive. This does not affect their appearance or rate of growth for the first few months, but tends to do so in later life, particularly if comparable set-stocking conditions are followed after weaning. One of the main objections of the practical dairyman to the rotational system is that in contrast to the calf paddock method more labour is involved in bringing the calves in for feeding and removing them to their field after feeding. The only answer to this that is provided by experience at Ruakura is that calves are very rapidly trained to a rotational procedure and movement, and that the job can be quickly handled by any good organiser so that other activities are not interfered with. If any further comment is required, it is simply that no other method is known which will result so reliably in well-grown, thrifty dairy calves under North Island grassland dairying conditions. This latter statement is especially true if calves are being reared on anything approaching an extensive scale.

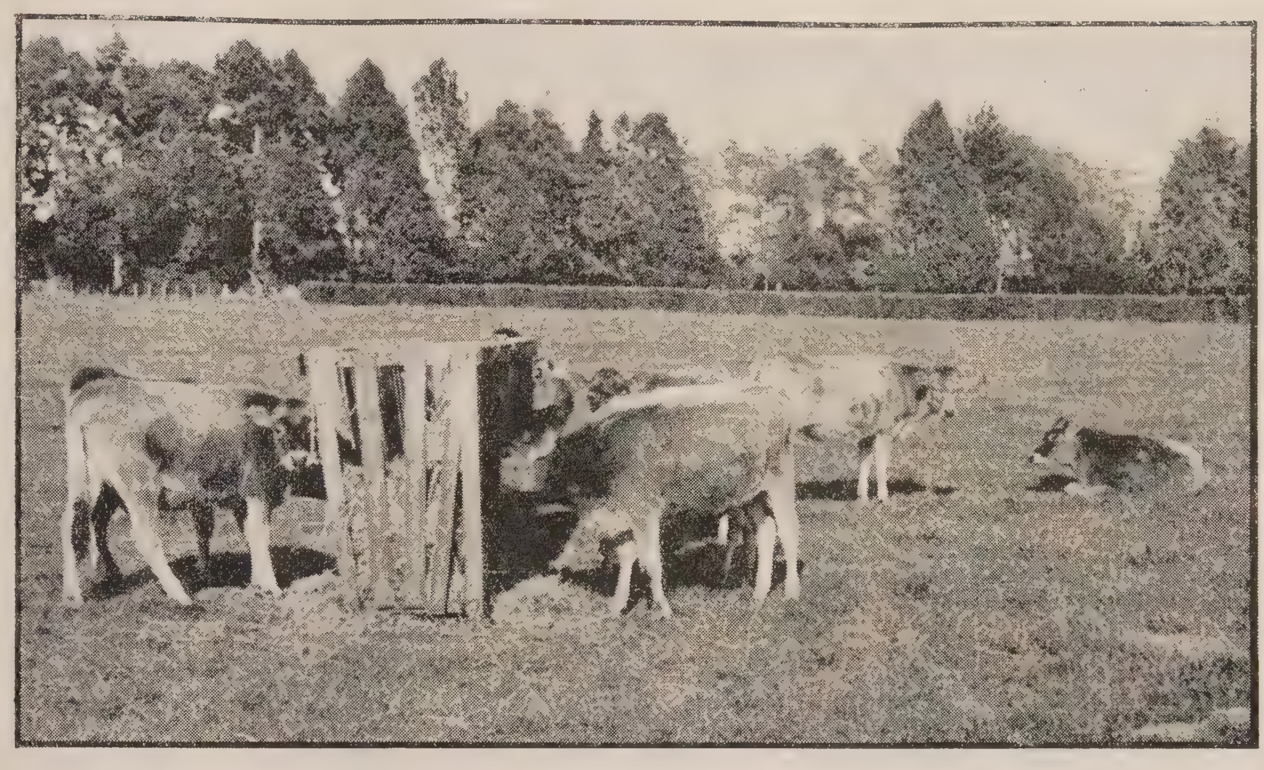


REARING WELL-GROWN DAIRY HEIFERS



The poorly-grown group of calves shown in the top illustration have been set-stocked. The well-grown condition of the rotationally-grazed calves in the second group is evidence of the value of rotational grazing.

The well-developed rotationally-grazed two-year-old immediately above should be contrasted with the under-developed set-stocked two-year-old at the right.



Rotationally-grazed calves at pasture. A hay rack is provided, as it is essential to accustom the animals to this fodder. Failure to feed hay when rains come and lush growth commences may cause severe scouring.

Yearling and Two-year-old Stage

When the preliminary results of rotational management of calves and weaners were first reported about five years ago by C. E. Ballinger, who initiated the work, two quite important questions were asked. The first was, What would be the effect of continuing rotational grazing as compared with set-stocking right through to the yearling and subsequently to the two-year old stage; would the animals concerned continue to show marked differences, thus affecting the ultimate mature weight and size of the dairy cow? The second equally pertinent question was, Would the well-reared calves not only result in bigger cows, but would these produce more butterfat over longer productive life?

A full answer cannot be given as yet to these questions, but data are accumulating on some of the issues raised. For example, four years of results are to hand on yearlings and two-year-olds reared under the two systems. In each year results are just as consistent and as clearly defined as at the calf and weaner stage. Thus at 18 months of age—the commencement of their second winter—in-calf yearlings reared under the rotational plan have averaged 140lb. heavier than their set-stocked mates. Thus the initial advantage at the commencement of the first winter has been approximately doubled by the commencement of the second.

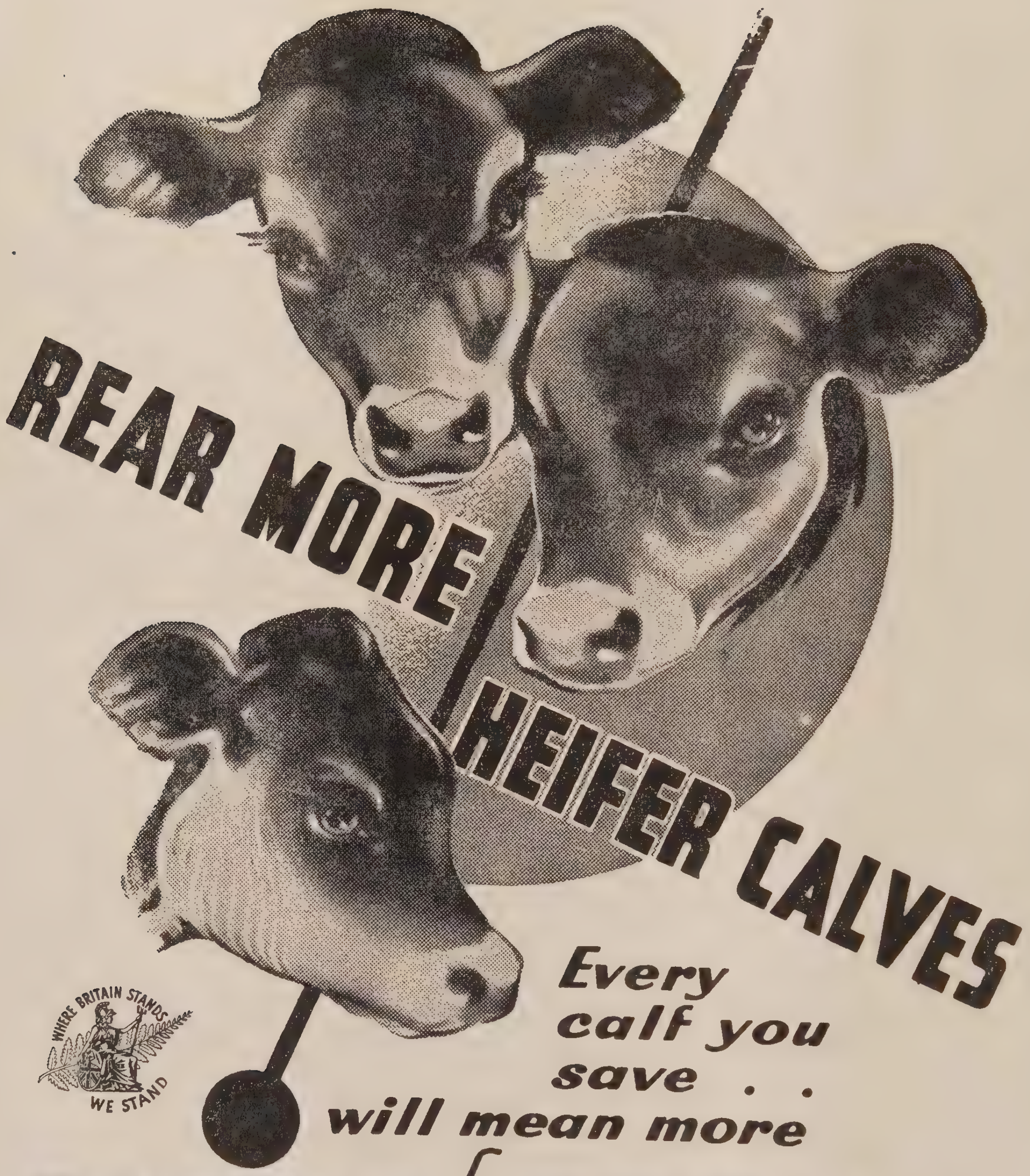
Continuation of the system to the two-year-old stage has resulted in down-calving rotationally-grazed two-year-olds reared averaging 750lb. body weight as compared with 600lb. for their set-stocked counterparts. That these differences tend to persist at least as far as four years of age is quite clear from the subsequent development of the older animals of the experiments.

On the production side insufficient information is as yet available to provide a reliable index of the relative efficiency of the two types of cow. Obviously much will depend on how the animals are fed after calving. At Ruakura feeding of each type of heifer in two different ways is under test and the results will be of interest to every dairyman. All that can be said at present, however, is that during the first lactation as two-year-olds a marked difference in butterfat yield per cow has existed in favour of the well-grown stock where these have been continued to be managed under a rotational-grazing plan. Over three successive years set-stocked animals that have been continued on an extensive, set-stocking grazing system have averaged approximately 50lb. of butterfat per cow less than their rotationally-reared and rotationally-grazed two-year-old mates. The precise story when poorly-reared two-year-olds are fed on the rotational-grazing plan from the time of first calving and when well-reared two-year-olds are grazed throughout their milking life on an extensive system is as yet in the very early stages, and no definite results are available. Indications are, however, that good rearing has certainly paid dividends, at least during the first years of the milking life.

For the same reasons as mentioned above—the early stages of the experiment—no data can yet be given on the relative ability of poorly-reared and well-reared stock to withstand disease while in the herd. Though this is so, the benefits obtainable from reducing mortality during the growing period and from greater production during the early milking life make it worth while for every dairyman to aim at well-grown dairy heifers. The method is simple—movement, movement, still more movement, resisting every temptation to leave calves or any other young dairy stock more than a few days in one field. By this simple procedure most of the worries associated with the growth of young dairy animals can be eliminated.

FEEDING SKIM-MILK TO PIGS

"Enquirer."—Considerable misapprehension appears to exist regarding the wisdom of feeding sour skim-milk to pigs. Systematic tests conducted from time to time show that the difference in the results obtained from feeding sweet skim-milk and sour skim-milk is not sufficient to warrant one being claimed better than the other. However, if sour skim-milk is used, it is important to ensure that the milk has not passed the sour stage. Putrified milk will upset the digestive system and give rise to scouring, which in turn can cause serious secondary upsets more difficult to remedy.



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Pullorum Disease a Heavy Burden on the Poultry Industry

PULLORUM disease, or bacillary white diarrhoea, occurs all over the world and causes serious loss wherever poultry are kept. In Britain until recently it caused one-third of the deaths of all chicks submitted for post-mortem examination. In New Zealand 14 per cent. of the carcasses of all poultry, adult and chick, examined at the Animal Research Station, Wallaceville, during 1947 were found to be affected with pullorum disease. As it is the most important disease of chicks, rearing of which is now in progress in New Zealand, A. C. Howse, who recently arrived from England to become the Department's first Poultry Veterinary Officer appointed for full-time field work, describes the symptoms and the precautions which should be taken if its presence is suspected.

THAT pullorum disease is widespread in the Dominion is well known to all acquainted with the New Zealand poultry industry. Of a total of 153,058 birds blood tested in 1947, 10,426 or 6.8 per cent. were infected. Many flocks show a higher degree of infection, and very few are free from the disease. The majority of these reactors to the blood test would be in good general health and might appear to be laying well, but all would be carrying the germs or organisms which cause the disease, and a proportion would harbour the infection in the ovaries. Some of the eggs laid by these birds would be infected and, if hatched, would produce infected chicks; about 37 per cent. of the eggs laid by fowls reacting to the pullorum blood test are infected with the disease. Other reacting birds carry the organisms which cause the disease in the heart, liver, gall bladder, and intestines; the droppings of these birds are infected and spread the disease to other fowls.

Though adult fowls reacting to the blood test may appear to be in good health and in full lay, the production from such hens is reduced. In one experiment conducted with 689 birds, reactors averaged 160 eggs during the pullet year of lay, while non-reactors of similar age from the same breed, strain, and type, and similar in all other respects, averaged 201 eggs a bird during the same period. In addition, pullorum infection reduces the fertility and hatchability of eggs. On incubation of an infected egg, the disease affects the developing embryo, which may die before incubation is complete.

Mortality Among Chicks

These effects, though not obvious, are serious. What is even more serious, and much more obvious, is the great mortality among young chicks in pullorum-infected flocks. Some of the eggs laid by a hen which reacts to the blood test contain infected yolks because the germs which cause the disease have settled in, and infected, the ovary of the hen. Each infected egg, if it hatches—and the fact that it is infected may prevent it from hatching at all—produces an infected chick.

Chicks are very highly susceptible to pullorum disease during the first few weeks of life, and particularly so during the first 10 days. Infection is spread from diseased to healthy chicks in incubators after hatching, particularly in large cabinet machines, the chicks being infected by mouth, by inhalation, and by contact with the droppings of their diseased fellows. Further spread of the disease continues from chick to chick in the brooders. This results in heavy mortality of young chicks, such as has already been experienced by many New Zealand poultry farmers.

The symptoms, as is generally the case with disease in chicks, are somewhat indefinite and diagnosis cannot be made on symptoms alone. The term "bacillary white diarrhoea" by which pullorum disease was formerly known is somewhat of a misnomer; though a whitish diarrhoea may appear, it is neither a constant nor a characteristic symptom. Infected chicks stand about under the hovers chirping dismally and looking miserable, and large numbers of them die. On post-mortem examination, the yolk sac, though drawn into the body cavity, may be found not to have been absorbed into the intestine, but that occurs with other conditions, such as chilling. Small yellow nodules may also appear on the heart and lungs.

Other conditions which may be confused with pullorum infection in young chicks are chilling and coccidiosis, both of which cause heavy mortality. In chilling, however, there are no nodules on lungs or heart, but only congestion of the lungs and other internal organs. Coccidiosis usually attacks older chicks—from three weeks onward—and causes blood-stained droppings in acute outbreaks. On post-mortem examination of chicks which have died from coccidiosis, the caeca (the twin blind guts toward the end of the intestine) are usually found full of blood-stained exudate, caused by hemorrhage from the inflamed and badly-damaged caecal wall.

Infected Hatch Must be Destroyed

The only certain way in which pullorum disease in chicks can be diagnosed is by bacteriological examination, which can be carried out only at a laboratory. In all suspected cases, therefore, a few dead chicks should be dispatched at once to the Animal Research Station, Wallaceville, Private Bag, Wellington, for a diagnosis. This service is free, and poultry farmers should avail themselves of it in their own interests.

PULLORUM DISEASE IN CHICKS . . .

If pullorum disease is diagnosed, treatment should not be attempted, but all the infected hatch should be killed and the carcasses burnt. If that is not done, a proportion will survive and grow to maturity. The disease may not affect their general condition, though growth is retarded in some cases, but such survivors of an outbreak will infect other birds through the droppings, and on reaching maturity will lay infected eggs which, if hatched, will produce infected chicks and perpetuate the disease.

Yearly Testing Not Enough

The only way to eliminate the disease is by continuous blood testing of all adult fowls and slaughter of reacting birds. At present the New Zealand poultry industry is carrying a heavy burden in the form of pullorum infection. Breeders are aware of this and most of them take advantage of the Department of Agriculture's poultry advisory service to have breeding stock blood tested and reactors removed before the breeding pens are made up. That reduces infection and is a step in the right direction, but it is not enough. One test a year of breeding stock will reduce losses in chicks, but adult fowls which react at annual tests leave infected droppings behind, some of the germs in which escape even the most rigorous disinfection and infect other birds after the reactors have been removed. There is an interval of from three weeks to a month between infection and capacity to react; that is to say a bird which picked up infection a week before the flock was tested would not react, as it would not develop the capacity to do so until a fortnight to three weeks after the test. However, if the whole flock is tested again a month later, such birds will react and be eliminated at the second test.

For these reasons it is found that when flocks are tested only once a year there is a build-up of residual infection between tests, and even if all reactors are eliminated on each occasion, the percentage appearing 12 months later is usually as high as ever. Therefore flocks must be tested more frequently, and reactors must be removed and houses disinfected after each test. The ideal would be monthly testing, but such work must be governed by practical considerations, and testing as often as possible outside this interval until two successive tests of the entire flock are clean is the goal for which to aim. Experience overseas indicates that by such methods most flocks could become pullorum-free within two years, and then frequent testing is no longer necessary, provided care is taken that infected birds are not bought; in most cases flocks can be kept free by one test of all the birds every year.

A good start has been made and excellent work has been done by the poultry advisory service of the Department of Agriculture in demonstrating the existence of pullorum disease in the poultry stocks of the Dominion and in keeping losses within bounds, but the volume of blood testing has increased so much during the few years since it was begun that the officers of the Department are experiencing difficulty in handling all the work, even on the basis of one test a flock yearly. If the work is to continue, poultry farmers may be requested to assist by testing their flocks themselves under the supervision of the Department of Agriculture and subject to check testing. In this way the disease can be eliminated in time, as it has been from flocks in Great Britain and elsewhere overseas.

If Pullorum is Suspected

The following steps should be taken by a farmer who experiences losses in chicks which he suspects have been caused by pullorum disease.

1. About half a dozen dead chicks should be sent to the Chief Diagnostic Officer, Animal Research Station, Wallaceville, Private Bag, Wellington, with a letter giving brief particulars of the outbreak, including all relevant facts.
2. Until a reply is received, the affected batch of chicks should be isolated as far as possible.
3. If pullorum is diagnosed, affected chicks and all those which are weak or sickly should be killed and burnt.
4. Infected brooders should be cleaned out and thoroughly disinfected.
5. All egg shells, dead-in-shell chicks, and incubator debris should have been burnt already. Flat-top incubators or the hatching compartments of cabinet incubators should be fumigated with formaldehyde gas. Before that is done all movable parts should be removed, thoroughly cleaned, and disinfected in a 5 per cent. sodium hypochlorite solution or a 4 per cent. washing soda solution. For fumigation 1 fluid ounce of commercial liquid formalin and ½oz. of potassium permanganate crystals should be used for each 100 cubic feet of incubator space to be treated. Put the potassium permanganate in a metal pan or vessel, pour on the formalin, and close the incubator or hatching compartment for three hours, with outlets and inlets open.
6. If breeding stock and the rest of the flock have not been blood tested, this should be done without delay. In any case, the farmer should seek advice from the Poultry Instructor for the district or the Livestock Division, Department of Agriculture, P.O. Box 3004, Wellington.

Encouraging Native Wildfowl

Wild duck and ducklings in the lily-covered waters of a raupo-fringed pond.

IN recent years some species of New Zealand's native birds and animals, and particularly some of the most attractive wildfowl, have declined in numbers. The diminishing population of the native grey duck has been the result of several factors, including the depredations of introduced rodents and the vanishing natural haunts of such birds. Official steps are being taken to rectify the position by improving and protecting existing sanctuaries and by creating new breeding grounds, but the farming community can also be of material assistance. Many farms, especially in hill-country districts in the lesser-rainfall areas, contain sites for excellent waterfowl breeding grounds, though without full facilities for protection and seclusion. Natural or artificial ponds and dams, built primarily to supply water for stock, can be converted readily into havens for wildfowl without jeopardising their usefulness for the purposes for which they were constructed. Such action may not add to the productive value of the farm, but certainly it will not detract from that value.

—A. R. DINGWALL,
Instructor in Agriculture,
Wanganui.

BREEDING AND REARING ABERDEEN ANGUS CATTLE

THE first cattle of the Aberdeen Angus breed, which is now the foremost beef breed in New Zealand and numerically constitutes the largest proportion of New Zealand's beef stock, which in the 1945-46 season numbered over 2,000,000, were imported from Scotland about 1863 through the enterprise of the managers of the New Zealand and Australian Land Company of Otago. Further importations of the breed were made by the same company in 1875 and 1883, and the New Zealand Agricultural Company established a stud at Waimea, Southland, about 1880. Other smaller studs which were established in both islands from the original stock imported by these two companies have been the foundation of the very large increase in herds in the last 20 years, particularly in the North Island, and more recently in the South Island.

CHARACTERISTICS of the breed, advice on the selection of foundation stock for the establishment of a stud, and management and breeding practices which have been successful on the Wairarapa property of a prominent breeder and judge of the cattle are described in this article.

Having assisted with the breeding and rearing of Aberdeen Angus cattle on their native heath, Mr. J. Ogilvy, of "Ngawaka," Gladstone, Southern Wairarapa, has been interested in the progress of the breed not only in New Zealand but in other beef-producing countries. His opportunity to establish a herd on his limestone property of high altitude and abundant water in the Wairarapa came in 1920, when low values of 10 to 12 guineas for registered cows enabled him to start with a herd of about 30.

There are good and bad cattle in all breeds, but the bad seemed to predominate in this first herd. However, in subsequent culling a system which has been adopted throughout by this breeder established his stud on sound stock. Cows without a good supply of milk, which he considers essential to do a calf well, were sent to the works; no foster mothers are kept. On the other hand no cow in good store condition is selected for killing if she is rearing a good calf. Cattle with misshapen hoofs were weeded from the herd and sent to the works. Mr. Ogilvy has never hesitated to cull an animal which is not a desirable type of the breed.

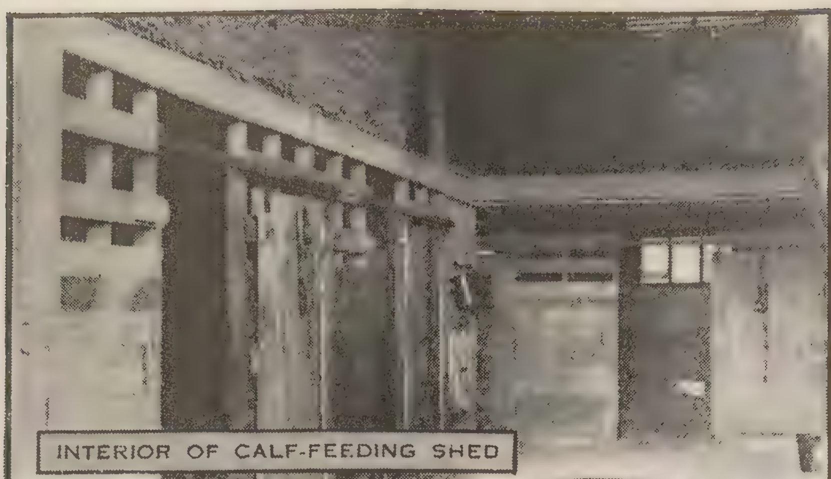
The first stud sire, a yearling bought for 100 guineas, considered then a big price, won numerous prizes at leading shows in both islands, but his progeny of both sexes were considered unsuitable, and none of his bull calves was kept for breeding and the sire was eventually sold in Australia. A sire imported from Canada left a number of quality females and good foundation stock.

Studmaster and Property

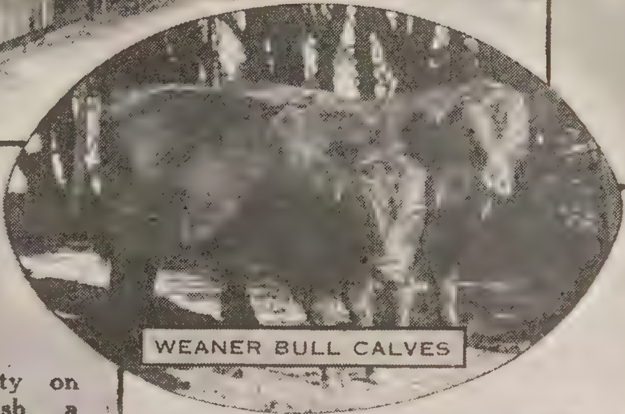
Unless a beginner in the breeding of stud stock is keen and is prepared to be a tireless worker, it is best to leave it alone, but with the ability to select good stock and a love for the work it is a different matter. A suitable property must have a good water supply, well-fenced paddocks with shelter and shade, and a suitable shed in which to feed calves during their first winter and in which to tie them up at frequent intervals for a few hours some time before they are weaned. Quiet handling of the calves is of great importance.

Heading photograph by Hope Cross and Richardson.

ABERDEEN ANGUS STUD FARM IN THE WAIRARAPA

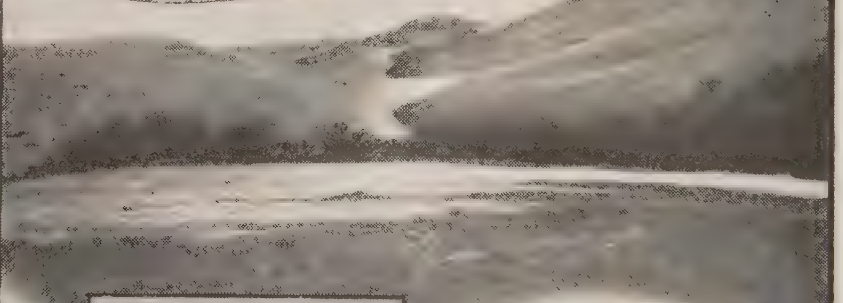


INTERIOR OF CALF-FEEDING SHED

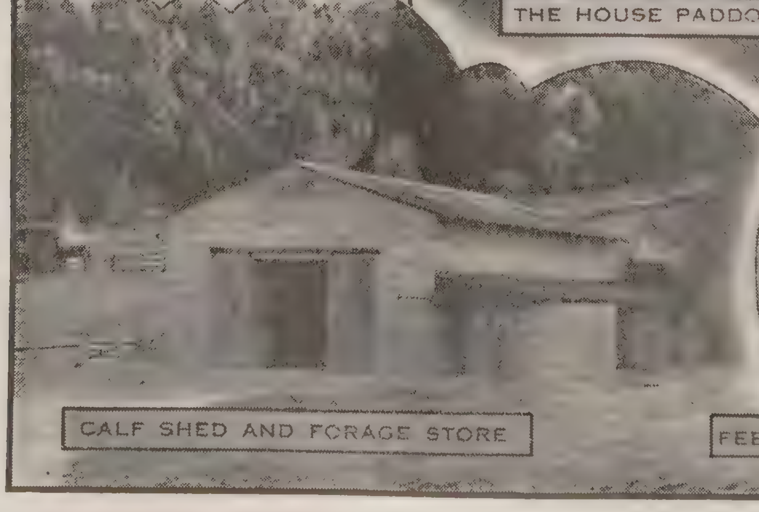


WEANER BULL CALVES

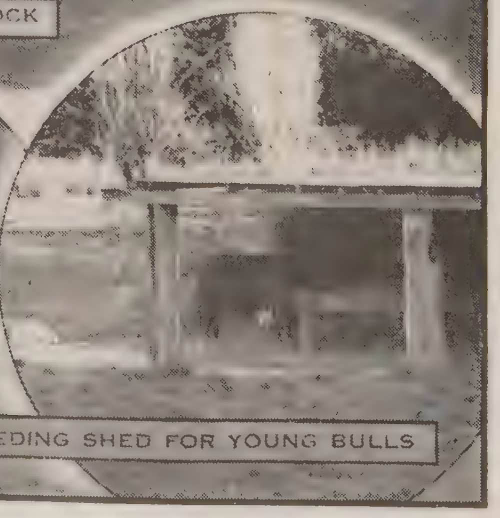
A suitable property on which to establish a stud must have good water supply, well-fenced paddocks with shelter and shade, and a suitable shed in which to feed calves and tie them up at frequent intervals for a few hours some time before weaning.



THE HOUSE PADDOCK



CALF SHED AND FORAGE STORE



FEEDING SHED FOR YOUNG BULLS

[Hope Cross and Richardson photos.

Qualities of the Stud Sire

The hardest part in starting a stud herd is to get the foundation stock. If an animal has been tentatively selected as a possible stud sire, it is wise before the purchase is made to inspect his sire and dam, if possible, and also others of their progeny to see how they have developed.

A good sire's head should be full of masculine character, with a well-defined poll and ears well set on, eyes full and clear, not sunken, and with good width between the eyes and short from the eyes to the nostrils, which should be wide and open. The throat should be clean with no loose skin below, the chest wide and deep, and the neck of medium length with full neck vein. A moderate crest is desirable, with shoulders well laid in to the frame of the animal and nicely covered on the points with flesh. The ribs should be well sprung; flat ribs are a bad fault. The back should be wide and level, loins broad, hook bones well seated and covered with flesh, rumps nicely filled with flesh, and the tail setting should be in line with the back, with the tail hanging close to the body. As the most valuable parts of a beef animal are the loins, rumps, and thighs, these are very important and cannot be overdeveloped. The hindquarters should be long from the hooks to the hocks and well filled with flesh before splitting between the hind legs. The forelegs should be wide apart and short, and well covered with flesh and muscle above the knees. Quality and not coarseness of bone should be looked for. The hind legs should incline forward below the hock and be set wide apart with a patch of white in front of the testicles, which is one of the characteristics of the breed. A side view of the animal with the flank full and deep should show both top and under lines in unison.

The animal should be smoothly and evenly covered with flesh, with no bumps of wasteful fat. The breed has long been described as the butcher's favourite; the excellent quality of the beef, so nicely marbled with fat, has no superior and there is a minimum of waste.

The colour of the animal is black, but harsh, wiry hair should be avoided. Skin which is soft and pliable and which presents no difficulty in getting a hold and shaking a portion on his ribs is desirable in the sire. A rusty brown tint in the hair with a nest of fur at the base is an indication of a quality animal, and of course only a sire with a docile disposition should be selected.

Qualities of Females

Just as much care is necessary in the selection of females for the herd, and many of the points looked for in the sire are also important in cows. Feminine character should be looked for. The head should be fine, the poll more sharp, the ears longer, the neck thinner, and there should be no crest. Hindquarters of the cow should be well developed, wide, and deep. The udder should be well formed, and a little white on or in front of the udder is no fault. The skin should be finer and with a touch of mellow fleshing all over the body. The hair should feel soft and have a thick, soft nest at the base.

Arranging Service and Calving Dates

With some excellent foundation stock acquired to establish the herd a decision about the proper time for the cows to calve must be made, and this depends entirely on the locality of the farm and climatic conditions in the district. In the Wairarapa August or September is best. When there is no flush of grass the calves are better able to cope with their dams' milk, though for a short period heavy milkers have had to be hand milked to prevent trouble developing in their quarters. The stud sire is never allowed to run with the cows. Vantage points in the fairly steep paddocks allow a good view of the property, and by going round the cows twice daily in the breeding season, say in November and December, the studmaster can select cows to take to a small paddock to be served. Next day they are probably returned to the main herd. Date of service and station number of cows and name of sire should be carefully noted at time of service.

Branding of Calves

Mr. Ogilvy firebrands all his calves about the end of December, and as the calves have been well handled, branding work is much easier. So convinced is Mr. Ogilvy that cattle are much better handled quietly at all times that before he goes out to muster his cows and calves he ties his dogs up.

[*Hope Cross and Richardson photo.*

The stud sire shows all the qualities which should be looked for in the selection of an animal to establish a foundation herd. Before the purchase of a stud sire his sire and dam should be inspected, and others of their progeny if possible, to see how they have developed.

A set of good irons with figures from 0 to 9 and the station brand are required, and a good fire with plenty of embers to get the irons white hot so that branding can be done quickly without leaving a blur. A record of the firebrand and station number on each calf and the dam's station number and sire should be kept. Then each calf has to be named and the name entered in the produce form with its date of birth and the names of sire and dam, and the form sent to the secretary of the Aberdeen Angus Cattle Breeders' Association, Hastings.

Weaning and Feeding of Calves

In weaning calves in the Wairarapa a lot depends on the amount of grass available at the end of April. If the dams are milking well, it is better to wean later.

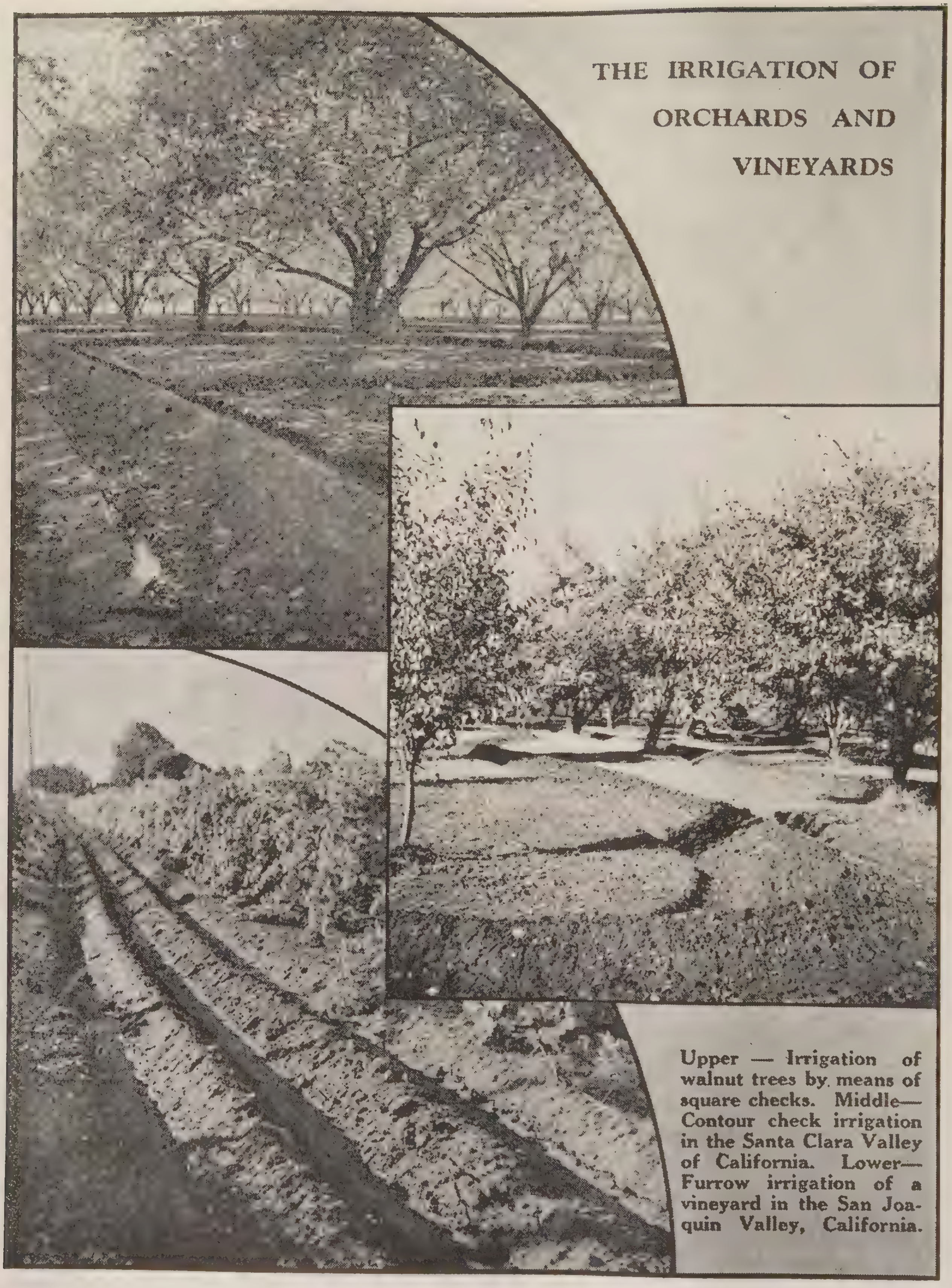
Mr. Ogilvy has no ground for cultivation, and his cows and rising two-year-old heifers are wintered on pasture, as it would be unprofitable to buy hay for breeding stock. He therefore has to be careful always not to overstock.

When he weans he finds it advisable to spread the separation from the cows over a few days. With a suitable building for the feeding and handling of stud stock, the aim is to keep young animals thriving so that they never lose their milk fat. Feeding should be started gently and gradually increased, always taking care that the trough is clean and that hours of feeding are regular. A breeder who has to buy hay, straw, crushed oats, and linseed meal cannot afford to have them wasted. Good feeding will not make badly-bred animals into good ones, and forcing young cattle with artificial meals and molasses while they have little opportunity for exercise often gives bad results.

Washing of the calves' coats on mild days with a non-poisonous dip and a frequent brushing all over are beneficial. The sexes are separated for daily exercise into two small paddocks where good water, rock salt, and shelter are available. Tying them up inside overnight with a halter and leading them out to the paddock gate each morning are part of their training.

Stud bulls are offered for sale as two-year-olds. They are fed in an open shed with a concrete floor and a manger for hay and an extra strong feed box, all under one roof. For exercise they have a well-sheltered paddock adjoining. With the heavy rainfall during some winters in the Wairarapa it is sheer waste to feed out hay in the open.

THE IRRIGATION OF ORCHARDS AND VINEYARDS



Upper — Irrigation of walnut trees by means of square checks. Middle—Contour check irrigation in the Santa Clara Valley of California. Lower—Furrow irrigation of a vineyard in the San Joaquin Valley, California.

Water-spreading Methods in Irrigated Areas of U.S.A.

By N. LAMONT, *Assistant Irrigation Officer, Ashburton.*

IRRIGATION is no longer an art, but an exact science. For each soil, crop, and climate there is a correct quantity of water to apply for maximum effectiveness and maximum economy of water use. Once that has been determined, either approximately by experience or more accurately by scientific tests, the necessity remains to evolve a method of water application which will satisfy these requirements.

THROUGHOUT the irrigation areas of the United States of America all the relevant factors vary widely—crops grown and methods of farming, water supply in both quantity and quality, soil types, topography, labour and power supply, and climate—and as a result water-spreading practices are equally varied. In some cases the methods in use represent the ideal of efficiency and satisfy all requirements, but often one factor has been allowed to override others with consequent loss of efficiency. For instance, in the relatively-few areas where water is abundant systems are in use that are perhaps cheap to establish, but which lead to waste of water and of labour. But in a general way the methods in use in a particular area have evolved to suit its special circumstances and to a varying degree are successful in meeting them efficiently.

Efficiency in the use of water is not easy to define simply, as a very large number of issues is involved. In its simplest terms complete efficiency would make available for use by plants the whole of the water delivered at the farm boundary with the maximum economy of cash and labour. The accomplishment of that objective involves numerous factors.

Factors Affecting Efficiency

First consideration must be the over-all planning of the location of ditches, which should be placed so as to reduce to a minimum expense of construction and maintenance, seepage losses, and interference with farm roads and stock water ditches. Assuming that the ground plan and general layout on a farm scale have been executed efficiently, a successful method of spreading the water on the paddock should enable the irrigator to water evenly so as to avoid both drowned and dry spots, and to apply neither more water than the soil can hold—with consequent waste through deep percolation—nor less than the soil's fixed capacity for water storage, when more frequent applications would be required, with waste of time and labour.

The achievement of these aims will also depend on the kind of crop being irrigated, the slope of the land, the permeability and retentiveness of the soil, and the head of water available, and for each set of circumstances a different method may be the best.

An outline of methods in use in the U.S.A. will show how American irrigators have sought to meet their distribution problems. Probably the best way to consider some of the different practices is to group them according to the type of crop being irrigated, though in some cases the same methods can be used for quite different classes of crop.

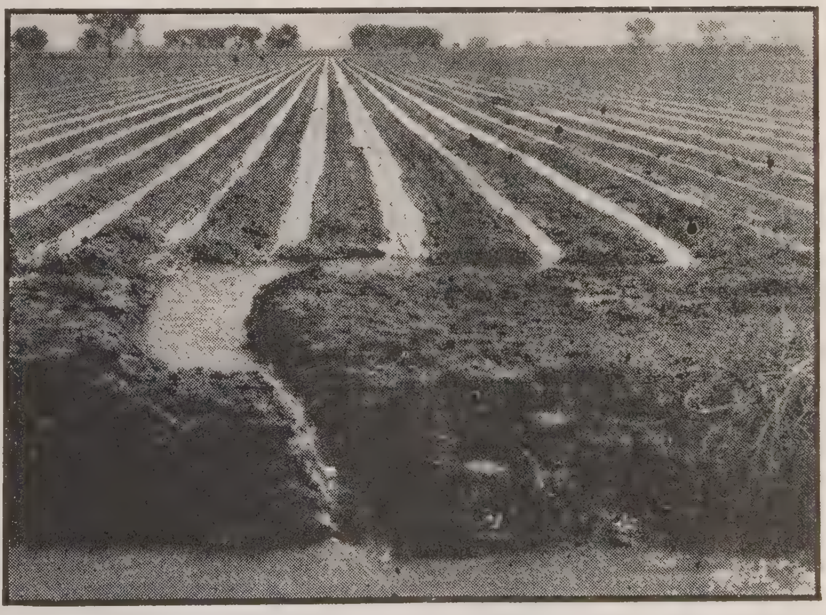
Orchards and Vineyards

The most popular method of distributing water in orchards and vineyards is by furrows, as shown on the opposite and next pages. The tree rows are usually planted along the line of greatest slope, and a number of furrows, usually four, six or eight, is shaped up between each row. The aim is to regulate the flow of water in each furrow so that it just reaches the end of the run, and that is maintained until the soil has been saturated to the required depth. If the soil is relatively impermeable and falls fairly steeply, a very small flow may be run into each of many furrows and maintained for perhaps as long as two or three days. Where soils are more permeable and slopes less steep, a bigger flow in fewer furrows for a shorter time is allowed.

This method has been found more economical of water than methods that wet the whole ground surface and equally as effective—in fact there is evidence to support the belief that there is no need to wet the whole of a tree's roots.

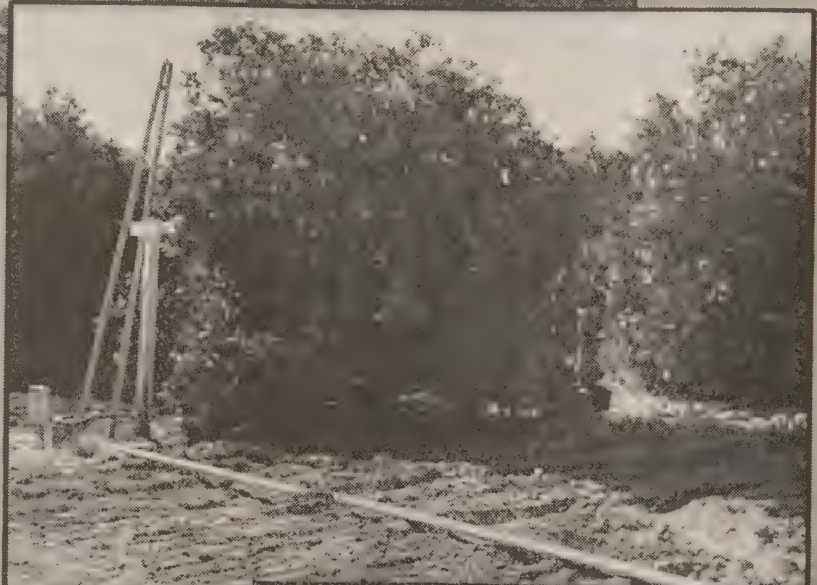
The illustrations on the next page show two methods of dividing the water into the furrows. In some cases a pipe spile leading from a head ditch empties a steady supply of water into a basin from which six furrows are supplied. In others the source of supply is an underground pipe with a riser at the end of alternate rows of trees. From each riser a pair of light 4in. pipes is taken across the heads of the furrows, with a port in the pipe opposite each furrow. In the type illustrated, which is far from commonly in use, the pipes are hinged at their connection with the riser and can be lifted after each irrigation, so providing no obstruction to cultivating, spraying, picking, or other traffic.

The flooding of the whole soil surface is also common in orchard irrigation, both on permeable soils, when border dikes can be used, and on impermeable soils, where different types



The commonest form of furrow irrigation in the United States. Water runs from a main supply ditch in the foreground into a subsidiary ditch, which in turn supplies a number of furrows.

FURROW IRRIGATION OF ORCHARDS IN AMERICA



Upper—Furrow irrigation is the most common method applied in orchards in the United States. Middle—Water is obtained from a riser at the end of each tree row, and a pipe, in which are ports opposite each furrow, supplies the furrows with regulated amounts of water. Between irrigations the pipes are raised and lean on the posts as illustrated. Lower—A spile from the head ditch delivers water into a basin from which furrows fan.

of checks are filled with water which is allowed to soak away. The illustrations on page 153 show methods by which the levees are built on the contour lines, and square basin checks. In either case the area within the check is virtually level and water can be applied evenly.

Though still in common use, orchard sprinkler systems do not appear to be gaining in popularity. Indeed, the high-level system of watering from above tree-top level is not recommended for a number of reasons, including high evaporation loss because of the leaf surfaces being wetted, probable spreading of disease, and the removal of spray deposits. Low-level systems, with one sprinkler to each four trees, are still popular, especially where topography is uneven.

WATER SUPPLY TO FURROWS

A modern touch is provided by these plastic siphons instead of the more common spiles for supplying crop furrows.

Row Crop Irrigation

About two-fifths of all irrigation in the U.S.A. is on row crops. Crops such as maize, sugar beet, cotton, potatoes, and beans are almost invariably irrigated through furrows between the rows. As with orchards, the object is to provide a flow which will just reach the end of each row. Apart from well-worked soil of even texture and an even fall, the important factor is the regulation of the flow into the head of the furrow. A wide variety of methods is used, some of which are illustrated.

The trend would appear to be toward greater use of pipes, both surface and underground, which permit much more efficient use of limited water supplies, as well as avoiding the weed nuisance along open ditches. In pasture irrigation, where head ditches are grassed and grazed much as the paddock as a whole, weeds in head ditches are not such a problem as where cleanly-cultivated row crops are being grown. Seeding weeds along the banks of a crop head ditch can lead to serious weed infestation through the water. To avoid this, and also to save evaporation and seepage losses as well as valuable space, underground pipes in place of open head ditches are quite common, particularly in California, on highly-intensive truck or fruit farms. This practice should not be confused with sub-irrigation, as the water is merely conveyed in these underground pipes and is spread over the surface when irrigating.

A simple and efficient row-crop irrigation system consists of pipe spiles leading through the ditch bank into each furrow and controlled with a flat stick thrust into the mud.

In the north-western corner of the country, where timber is plentiful, wooden flume head-ditches are used with various types of adjustable openings to regulate the flow of water into each furrow.

Open head-ditch systems are the most common, and frequently the water is distributed into the furrows simply by digging a gap in the bank. That is rather unsatisfactory, as regulating the flow through such a cut is impossible without constant supervision, and the spile system is more popular. Spiles are pipes of metal or wood puddled into the bank of the head ditch just below water level. They feed a steady flow of water to the furrows with little risk of blockage from floating rubbish, and are regulated or closed by a flat stick thrust into the mud against the mouth of the spile.

A more recent method which was also popular was the use of siphons of metal, rubber, and in some cases transparent plastic material. Their disadvantage is that they have to be restarted if the water level of the supply ditch should drop too low, but they allow the maintenance of a solid, undisturbed bank.

Pasture, Lucerne, and Cereals

Border dikes are much the most commonly-used method for the irrigation of close-sown crops such as pasture, lucerne, and cereals. In many

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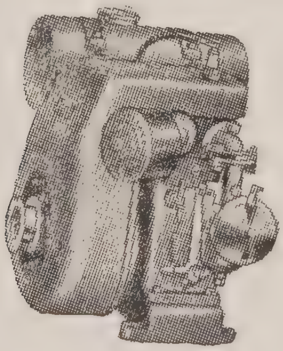

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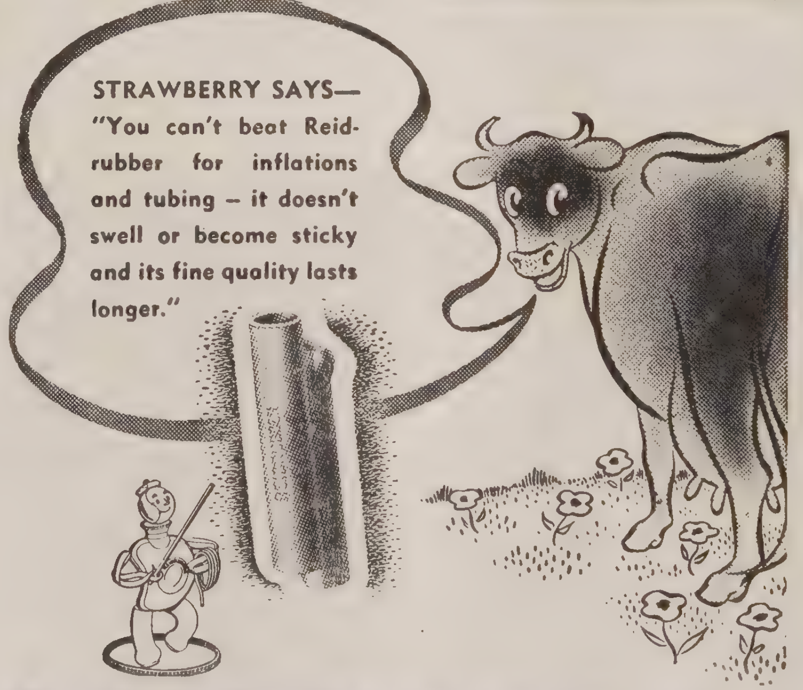

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cases water is not used efficiently in pasture irrigation, and research workers appear to have given less attention to this type of irrigation than to orchard and row-crop methods. In some districts border area in relation to slope, soil permeability, and head of water has been studied carefully, and efficient patterns are used. Borders range from 10 to 60ft. in width and from five chains to half a mile in length.

An interesting practice in certain areas is the use of corrugations and border dikes together for establishing young grass, cereals, or lucerne. Corrugations are very shallow furrows, usually more or less scratched on the surface about 18in. apart, and in these instances are on paddocks which are also bordered. Their purpose is to assist the establishment of young seedlings before they are considered sturdy enough to stand up to border-dike flooding. The water is trickled down the shallow corrugations and wets the soil by lateral seepage without risk of surface caking or washing out of seeds or seedlings.

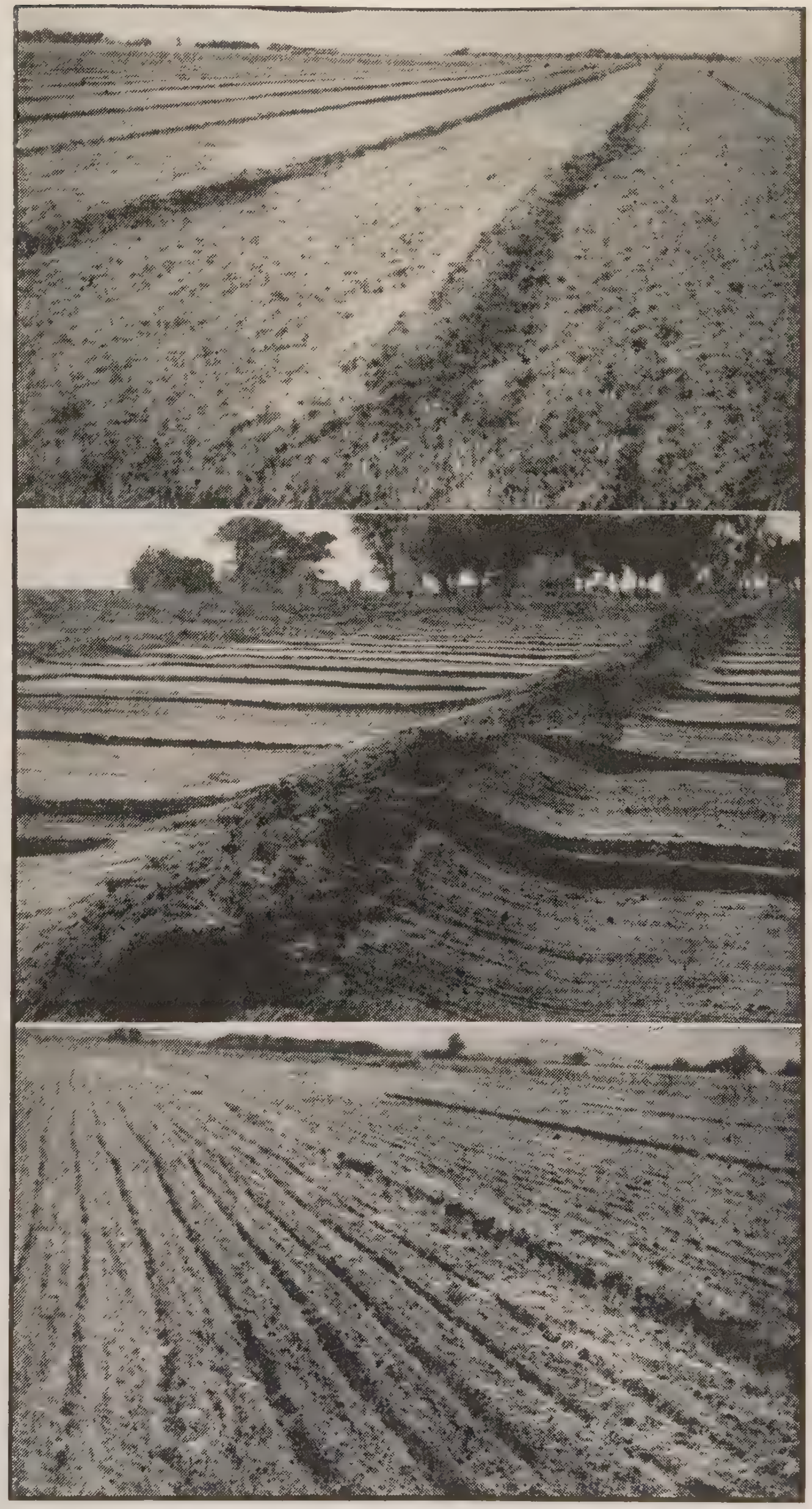
On country with an even surface and steep fall there are some border ditches, and occasionally contour and wild flooding, but by far the commonest is the border-dike method as it is known in New Zealand.

A popular practice in the northwestern and to some extent in the eastern States is the use of high-pressure, portable sprinkler systems. Operating at pressures of 30 to 60lb. to the square inch, each sprinkler may cover up to a third of an acre of pasture or low-growing crops. A large variety of types of sprinkler is used with numerous kinds of quick-coupling devices to enable portable pipelines to be handled conveniently. Some farmers use 4in. diameter aluminium pipes, which are very light and easy to handle, but a more common material is light-gauge galvanised iron. Sprinkler systems are favoured where the irrigation season is short and irregular, where only a portion of the farm is to be irrigated, where the water supply is small, steady, and not available at high levels of the farm, where soils are shallow and porous, or where topography is so uneven that levelling would be unduly expensive.

Sub-irrigation

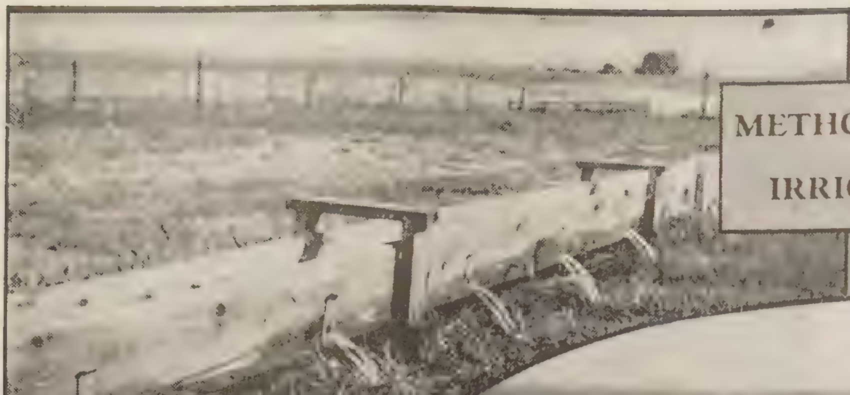
Except in most unusual circumstances, sub-irrigation has nothing to commend it. It is used in the U.S.A. to a limited extent and consists of filling up the soil with water from below from ditches or porous pipes instead of spreading the water over the surface. Where a reasonably porous layer of soil overlies an impervious subsoil, or a permanent water table, it can be used, but it has undesirable features and only rarely any particular advantages.

TYPES OF BORDER IRRIGATION

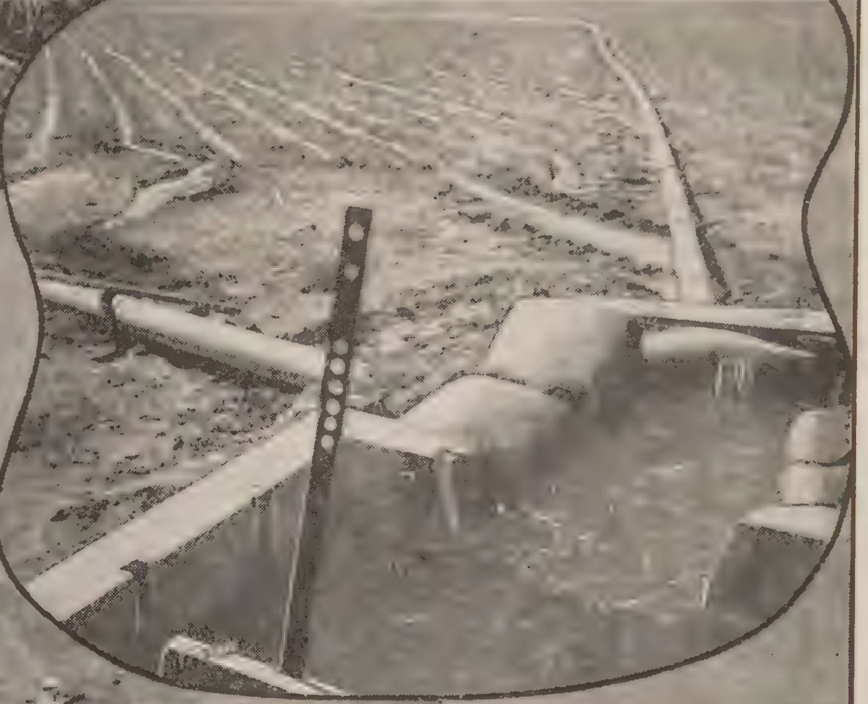


Top—Bordered pasture near Oakdale, California, where borders were only about 12ft. wide. Middle—A Californian method of forming border levees. Lower—The use of corrugations and border dikes in Idaho.

METHODS OF CONVEYING IRRIGATION WATER



Above—In the north-west, close to cheap timber supplies, wooden flumes take the place of the usual earth head ditches. Right—The use of pipes as "head ditches" is becoming increasingly popular in the U.S.A. Ports in the pipes supply water to one or two furrows each.



Left—Laying an underground pipe supply system. Risers at intervals of a few feet supply the usual inter-row furrows. Below—Adjusting the flow of water from risers from underground "head ditches."

In one district in California a system of sub-irrigation is in use that suits the circumstances. The area is a swamp at a river-mouth that has been reclaimed by stopbanks and a pumping system and can be maintained in cultivation only by almost continual pumping. When irrigation is required during the dry season the pumps are stopped periodically and the water allowed to rise in the drains, and of course in the soil, until the whole is saturated, when the pumps are restarted and the surplus water drained away.

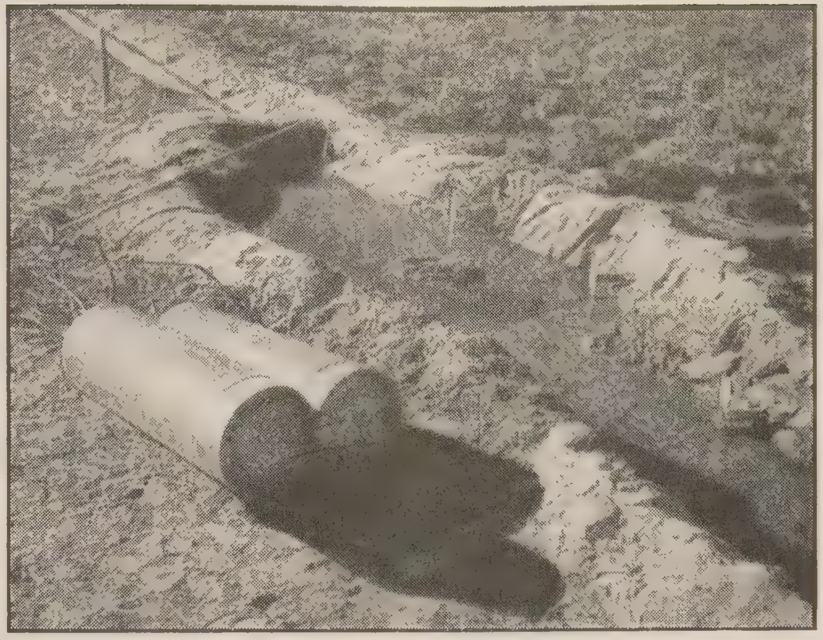
Fertilisers Applied with Water

In addition to the main practices outlined, various devices and "tricks of the trade" are used that may prove applicable in New Zealand now or in the future.

One of these is the application of fertilisers through irrigation water, which is done with sprinkler, row-crop, and border-dike systems. In sprinkler systems an inlet tap is placed on the intake side of the pump and the fertiliser, which must be completely soluble, admitted during irrigation.

Another novel method, shown on this page, consists of allowing ammonia from high-pressure cylinders to mingle with the water being applied to a row-crop.

In another case liquid manure from the milking shed is admitted to the head ditch and applied over the borders with the irrigation water after first passing through settling tanks to remove most of the solid matter.



Ammonia from cylinders is released slowly into the irrigation water so as to combine irrigation with the application of nitrogenous fertiliser.

Application in New Zealand

It should be emphasised that in a general way each of the water-spreading practices in use in the U.S.A. has been evolved to meet some particular set of circumstances. In some instances apparently similar circumstances exist in New Zealand, and in others it is conceivable that similar circumstances may arise as irrigation agriculture develops. It will be one of the primary functions of irrigation research in New Zealand to examine these various practices fully under local conditions and advise irrigators about the most efficient method to employ.

Misuse of irrigation water can have seriously harmful effects on crops and soil, and water has to be paid for whether it is obtained through a public scheme or through expenditure on power for a private pump. The attainment of a high level of efficiency in spreading water is therefore of the utmost importance, and it is not surprising that large sums are spent in the U.S.A. for research on this subject. Experience in that country shows that almost invariably the fault lies in over-use of water rather than under-use, and a recent survey in the State of Utah records average efficiencies ranging from 80 per cent., which is a very good figure, down to less than 10 per cent., indicating gross wastage of water.

New Zealand is fortunate in that advantage can be taken of the lessons learned in the U.S.A., where in some areas irrigation has been practised for 100 years, not so much by simply imitating their practices as by using their research methods to ascertain which can be employed to establish farm irrigation on the highest possible level of efficiency.

◆

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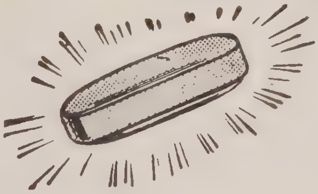

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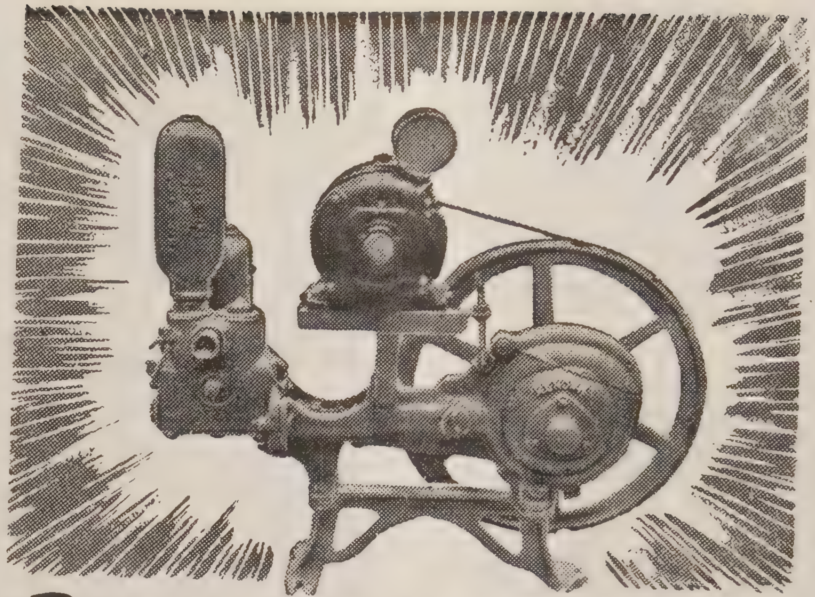

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THE GROWING OF MUSHROOMS

By **A. G. KENNELLY**, *Instructor in Vegetable Culture, Christchurch.*

THOUGH the mushroom is valued as an article of diet in New Zealand, few home gardeners have attempted to grow it. Its popularity and the quality of the produce that can be grown from spawn obtainable from most good seedsmen merit the attempt to grow it when suitable facilities are available. There are a number of wild species of edible fungi in New Zealand, but the cultivated mushroom is a variety of *Agaricus campestris.*

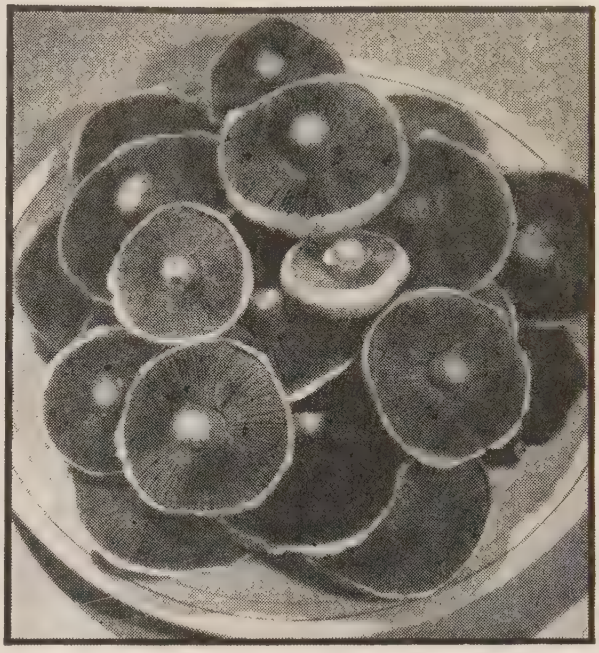
TOGETHER with yeasts, moulds, and mildews, mushrooms belong to that great group of plants known as fungi. The fungi as a group may be considered the scavengers of the vegetable kingdom, for they seize on all dead and decaying vegetable matter and soon reduce it to a condition in which it can again be utilised by plants. Fungi which obtain their food from living plants or animals are called parasites, and those which derive their food from dead plant substances are called saprophytes. Fungi cannot make their own food as green plants do, because they lack the green chlorophyll by which ordinary green plants are enabled in the presence of sunlight to promote the union of carbon dioxide and water to form sugar, which the plant further builds up into starches and other substances for its growth. Fungi on the other hand are able to live without light.

What is commonly called a mushroom is not truly a vegetative body at all, but is merely the fructification (fruiting stage) of a fungus. As the mushroom fungus has no flowers, it produces no seed. It reproduces its kind by means of minute bodies called spores, which are formed on the gills under the "cap." The cycle of life of the mushroom fungus can be divided into three stages: 1 spores, 2 mycelium (spawn), 3 mushroom.

Spawn may be obtained from most good seedsmen in either "bricks" or in bottles. The bottle method of carrying spawn is the more modern method, and is claimed to give a product that is much purer and truer to name than brick spawn; in addition, because it is usually fresher and moister, it starts growing much more rapidly when planted and is less likely to fail.

[*Green and Hahn Ltd. photo.*

Mushrooms growing on an abandoned lawn.



[*Green and Hahn Ltd. photo.*

Brick spawn is made up of hard, dry blocks of compost usually about 8in. long by 7in. wide by about 1½in. thick and is full of threads of mushroom spawn.

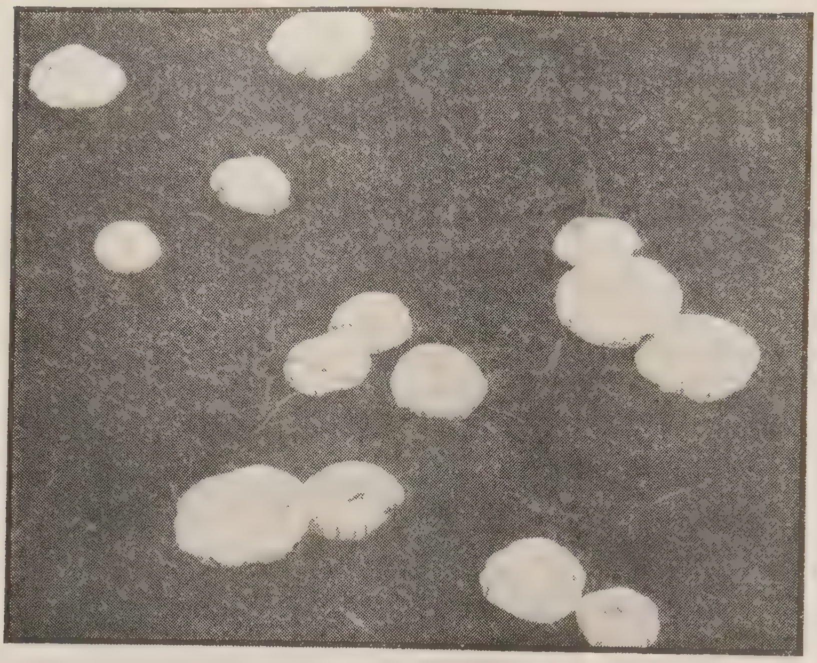
Culture

Mushrooms are not easy to grow. The only sure way of growing them is the standard method, in which beds of fermenting horse manure are spawned under controlled and strictly-hygienic conditions. It is possible to grow mushrooms outside in open paddocks, but there is no certainty in the method. On occasions, however, if a good turf paddock is available, the method is worth trying on a small scale. The spawn can be planted below the turf either with or without manure, though there is more chance of success where manure is used. The manure should be prepared in the same way as for the standard-type bed. November to February are the best months, but in the north spawning could take place even later. The usual method is to take out slices of turf about 1ft. square with about 1½in. of soil adhering to them. About 3in. to 4in. of soil are removed and prepared manure is pressed firmly into the cavity. The manure should be spawned according to the spawn-maker's directions and the turf replaced and firmed so that there is no trace of its having been lifted. The plantings should be not less than 2ft. apart. If spawning is followed by continuous dry weather, the spawned areas should be watered to keep the cut turf moist and alive, but where manure has been inserted watering should be applied with discretion, for the manure underneath should not be made wet. Though much depends on weather and the condition of the turf, mushrooms may be expected in from about six to ten weeks, but occasionally the period is longer.

Growing Mushrooms in Beds

Though the only reliable method of growing mushrooms is in properly-prepared beds of fermenting stable manure, correct preparation of the manure before it is made up into the bed is of geat importance. Mushrooms can be grown in cellars, wooden sheds, glasshouses, frames, stables, or almost any place where equable temperatures can be maintained and draughts excluded; beds can even be made up outside in favourable weather. Worked-out

THE GROWING OF MUSHROOMS



[*Green and Hahn Ltd. photo.*

A desirable type of wild mushroom growing on a rich turf. It is closely allied to the cultivated species *(Agaricus campestris).*

mines, tunnels, catacombs, and quarries are also used overseas. For the first few weeks after spawning it is not advisable to allow the temperature to drop below 50 degrees F. This is to ensure that the spawn runs freely in the beds. Once it has run the temperature can drop very much lower without doing any harm beyond retarding growth until the temperature again rises. For best results temperatures should not rise above 70 degrees F. The higher the temperature is above 65 degrees the greater is the likelihood of moulds and rots developing and destroying the crop. Probably the ideal temperature is between 54 and 58 degrees F. Fluctuating temperatures are very harmful, and variation should not exceed 3 or 4 degrees on either side of this. If a glasshouse equipped with hot water pipes is available, the heat may be used if required, but kerosene or gas heaters are not recommended, as the fumes are often harmful. The air should preferably be fairly moist, but not excessively so.

Light is neither harmful nor beneficial, but sunlight is best excluded, as it is accompanied by some heat and thus has a drying effect. Fresh air is essential, but direct draughts must be excluded. The air should be gradually and constantly changed, but no special provision of ventilation should be necessary for mushrooms grown in small sheds or cellars; where larger areas are grown overhead ventilators are usually preferred.

Material for the Beds

For the home gardener in New Zealand there seems to be no suitable substitute for horse manure. If fresh manure that is not rain soaked is used, and certain principles are followed, its behaviour is usually consistent and so predictable. The manure should be clean and fresh; manure containing disinfectant or from horses under veterinary treatment should not be used, and the use of manure containing shavings, sawdust, or similar material is not advisable. The best type contains a good proportion of straw litter — up to 50 per cent. is satisfactory. Wheat or rye is usually preferred to oat or barley straw. The manure must be composted, that is, turned and mixed several times so that it heats and rots down gradually to the required even heat and texture. This mixing or turning should be done under cover and preferably on a concrete floor that has first been thoroughly cleaned and is situated where water will drain away from it; it should be well away from old rubbish heaps or material likely to harbour flies or other harmful insects. The manure should first be tested for moisture content by squeezing handfuls from different parts of the heap. If the material binds together under pressure, and only a trace of liquid is squeezed out, it is in suitable condition. If it is dry, it should be watered with a can having a fine rose until it is moist but not wet. This is important, because if it is made too wet, heating is retarded and it is often difficult to dry it out again sufficiently. The manure should first be forked over, thoroughly mixed, and foreign matter removed. Finally, it should be made into a deep, compact heap so that fermentation can take place. It should not be compressed, but limited consolidation will not have any adverse effect if the manure is not too wet and aeration is satisfactory. If it is necessary, the heap should be watered during the first or second turning, for straw will absorb more water when fresh than it will after it has partly rotted. There should be enough moisture to allow fermentation to proceed through several turnings and yet leave the compost just moist at the final turning.

If the compost has been forked over and heaped, it should be left undisturbed until fermentation has passed its zenith; this usually takes from seven to ten days and its outward manifestation is a slight sinking of the heap. During fermentation the temperature in the heap may reach from 100 to 160 degrees F. As soon as the sinking that indicates that microbial activity is slowing down occurs the heap should be turned again. The material should be thoroughly shaken out and mixed and the new heap made so that the outside of the old heap is on the inside of the new and vice versa. As turning proceeds some of the material within about a foot of the sides of the heap may have become dry and appear burnt, leaving a whitish ash. Material so affected should be thoroughly moistened and mixed throughout the heap. The compost should be tested for moisture content, and when turning is completed it should again be heaped compactly and left to ferment. Turning should be continued at intervals of four to ten days or whenever burning occurs. The number of turnings required before the composting process is complete may range from three to six and depends on the state of the material. Considerable judgment is required to decide what is the ideal condition, but when ready for making up into a bed the material should be warm, its colour should be a uniform blackish brown, and it should have a slightly greasy feel and a sweet odour suggestive of mushrooms. The straw should break or sheer off cleanly when twisted in the hands. If a handful of compost is firmly squeezed, there should be sufficient moisture for it to bind but insufficient to wet the hand properly. There is too much moisture in the compost if, when a handful is held close to the ear and squeezed, the movement of the juice can be heard. Too much moisture will adversely affect the growth of the spawn and may kill it if aeration of the bed is affected.

Types of Beds

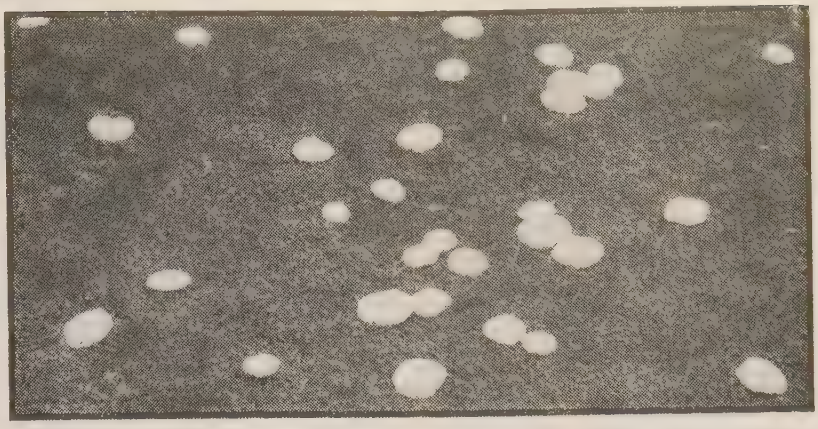
Mushroom beds may be either flat or ridged, or they may be made up on shelves or in boxes. Ridged beds are suitable for both inside and outside production. Boxes should be not less than 10in. deep and 2ft. long by 18in. wide. To facilitate picking, flat beds should not be too wide. Laid down in summer, they need not be more than 8in. deep, but under cool conditions or in cold frames it is better to use a depth of 10in. Ridged beds have sloping sides and in cross section are usually in the form of a triangle or a trapezium. They can be of any length, but when built outdoors should not be closer than 3ft. 6in. between the ridges, for when they are finished they must be coated with about a foot of straw, which blocks up any narrower pathway. They should be about 2ft. 6in.

wide at the base and 2ft. high, and the top, if flattened, should be about 6in. wide.

It is essential that the land on which mushroom beds are built should not at any time be wet and if necessary the beds should be built on planks raised above the ground or on a firm base of open material such as coke or shingle. The position of outdoor beds should be changed each year. Before laying down inside beds it is advisable to clean the floor and walls thoroughly, preferably with a 2 per cent. formalin solution. This should destroy the spores of any fungi which may be inimical to the growth of the mushrooms. Beds are made by forking the prepared compost evenly into position in layers and firming by beating it down with a fork or by treading on a short board placed on the compost. If the compost is not too wet, the firming may be done gently with the foot. A 9in. to 11in. layer would be reduced after firming to from 6in. to 8in. If a cold frame is used, the walls should be of good heat-insulating material such as brick, concrete, or turf, and if there is no danger of flooding or seepage, more even temperatures can be maintained by excavating about 6in. of soil and building the bed partly below ground level. Frames can be ventilated in the usual way by chocking up the covering light during the day with a piece of wood. The sash or "light", however, should be kept covered with suitable insulating material such as a combination of straw and sacking to keep temperatures even. If boxes or trays are being used, it is advisable, unless they are to be stored in sufficiently-damp conditions, to put 2in. of clean, fresh turfy soil in the bottom of each box to prevent drying out.

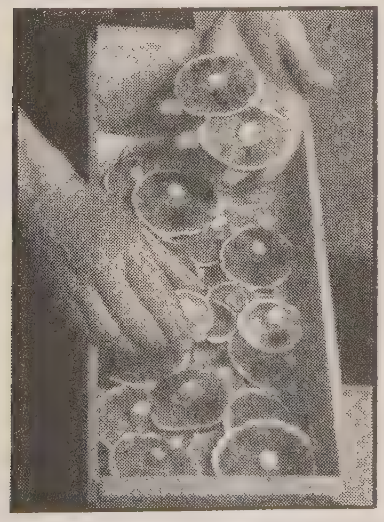
Spawning

After the beds have been laid they should be left for several days. Outside beds should be covered with straw to prevent excessive drying and to keep off rain. The temperature should rise again quickly and at this stage it is necessary to use a thermometer, preferably a plunge one. Internal temperatures of up to 140 degrees F. may be reached, and with ridge beds which have considerable bulk and where composting has not been correct it may be advisable if the temperature rises above this to make several holes in the bed to speed up cooling. This practice is not recommended except in extreme cases, for the holes must be refilled afterwards with clean, fresh soil and this sometimes presents some difficulty; the soil introduced is often a potential source of infection with undesirable fungi.



[*Green and Hahn Ltd. photo.*

Thread-like mushroom mycelium often ramifies well-drained turf which has been manured by feeding stock. Where the mycelium has found a congenial environment groups of mushrooms often appear.



[*Green and Hahn Ltd. photo.*

Packing mushrooms for transit.

If the beds become too hot internally, they may dry out excessively or become too wet near the surface because of condensation of internal and perhaps external moisture. This can usually be controlled to some extent by covering them with straw or by giving added ventilation. Beds do not always cool evenly, but if, after testing, the temperature is nowhere higher than 70 degrees F., spawning may be commenced. Instructions for spawning are given by the maker with each package of spawn and should be closely followed. The usual practice is to insert pieces of spawn about 10in. apart in a diagonal pattern all over the bed, each piece being placed a depth of from ½in. to 2in. (according to the maker's instructions). A little of the compost should be removed each time and the spawn covered so as to be in contact with the compost all round. When finished the beds should again be covered with straw.

Casing the Beds

If the temperature of the beds and air has been kept at about 58 degrees F. or higher, the spawn should begin to run within eight to 14 days; at lower temperatures the delay is likely to be greater. If after carefully exposing the compost numerous strands of white cotton-like mycelium are seen developing in it, casing can begin. This is one of the most important operations in the growing of mushrooms. Any type of soil is not necessarily suitable. Ordinary surface soil from the garden, especially if it is rich in humus, usually contains bacteria, fungi, or insects which are likely to be a cause of trouble later. If garden soil is used, it should be sterilised and poor in humus. Subsoil or soil from the second spit is usually sufficiently sterile. If it is lumpy, it should be rubbed through a ¼in. mesh sieve. A light friable or sandy subsoil loam is probably ideal. Flat beds or boxes should be covered 1in. deep; ridged beds can be covered 2in. deep at the edges, thinning to 1in. at the top of the ridge. The soil, which should be moist but not wet, should be beaten gently and firmed evenly with the back of a spade. When the beds are cased the straw covering may be dispensed with, except on outside beds.

Attention to Ventilation

The best-quality mushrooms are usually grown at temperatures of 54 to 58 degrees F. and in an atmosphere that is damp but not excessively so. The air should be kept just moist enough to permit gradual evaporation from the beds. This can be achieved by attention to ventilation and if necessary by the "damping down" of the floor. If the casing dries out anywhere, it should be lightly watered with a fine spray, but only the casing should be watered. During the first six to eight weeks after the bed has been cased, which is the earliest that mushrooms can be expected under good conditions, watering with a fine rose may be necessary at weekly intervals. Salt at the rate of about 1 level tablespoonful to 2 gallons of water applied at weekly intervals if the beds are dry is said to be beneficial when cropping has begun. Outside beds usually take eight to 12 weeks or longer to come into bearing. The temperature usually determines the period taken.

Harvesting

Mushrooms first appear in small clusters over the points at which the spawn was planted and later they should cover the whole bed. They should be picked daily before the "cap" is fully expanded, by twisting each gently so that the whole mushroom with its stem is cleanly withdrawn. No rubbish should be allowed to fall on

MUSHROOM GROWING . .

the bed and trimming is best done elsewhere. All dead or dying mushrooms or mushroom parts should be carefully removed. After a mushroom or group of mushrooms is picked the fleshy stump should be removed and the hole filled with fresh casing soil.

A bed usually lasts two to four months and the total yield over the period varies from 1lb. to 3lb. per square foot. For the home gardener 1lb. per square foot could be considered very satisfactory. Mushrooms usually appear in weekly flushes. At temperatures of 60 degrees F. and higher production is usually heavy, but lasts for only about two months; at such high temperatures the mushrooms usually grow too fast and quality is affected. At 50 degrees on the other hand, though production over a given period will be lighter, the beds may continue to yield for four months or even considerably longer.

Insect Pests and Diseases

Millepedes, woodlice, spring-tails, mites, and the larvae of various flies are all injurious to the mushroom at various stages of its development; a number of fungus diseases are also liable to be troublesome. Hygiene is the most important factor in combating both insect pests and diseases. Enclosed areas where mushrooms are to be grown should be thoroughly cleansed and sterilised by washing with a 2 per cent. formalin solution or fumigated by closing the place and burning flowers of sulphur (also known as ground or sublimed sulphur) at the rate of 3lb. to 500 cubic feet of space. As turning proceeds care should be taken to include all odd scraps of manure in the heap so that they are subjected to the heat arising from fermentation. Odd scraps of manure left in corners or adhering to walls provide hatching grounds for the eggs of many species of insects which are easily killed if included in the fermenting heap. Just before casing the beds it is a good plan to dust pyrethrum or D.D.T. powder over them if insects are numerous. All refuse should be gathered and destroyed. Fine-mesh wire or cheese cloth over windows and ventilators is effective in excluding insects.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in September as under:—

Auckland—1YA, on September 28, at 12.35 p.m., "Choice of Breeding Stock and its Effect on Quality," by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Wellington—2YA, on September 16, at 12.35 p.m., "Feeding to Produce the Quality Carcass," by I. H. Owtram, Supervisor, Taranaki District Pig Council.

Christchurch—3YA, on September 20, at 12.35 p.m., "How we can Help to Improve Carcass Quality," by H. W. McIntosh, Supervisor, Canterbury District Pig Council.

BUDDING OF FRUIT TREES IN SPRING

By L. R. RENOUF, *Orchard Instructor, Alexandra.*

A METHOD of budding which enables fruit trees to be budded in spring instead of in late summer or autumn is used fairly extensively in parts of Canada. It is called plate or dry budding, but is sometimes referred to as the Jones method.

PLATE budding is done when the trees are at the same stage as for grafting, which is during September and October, but it is not necessary to have the bark slip from the stock, as in some methods of grafting and in shield budding.

Sticks of bud wood are saved in the same way as for grafting. Healthy wood of the previous season's growth should be taken during the winter and partly buried in the ground in a cool place to keep the buds dormant.

The accompanying illustration shows the four steps necessary for budding by the plate method. A section of bark is sliced from the stock over a length of 1 to 1½in., the cut being made downward (A). This section is then removed by making a wedge cut at the base (B).

The bud (C) is cut as in shield budding, but with a wedge cut at the base. The size of the bud should coincide with that of the cut on the stock. The bud is then fitted (D) and tied (E). To prevent drying out it is advisable to wax the union, as in grafting.

As in all budding and grafting operations, a very sharp knife is essential, and care must be taken to see that the cut surfaces of the bud and stock are even and that they unite over the whole area.

If material other than rubber bands is used, the ties on the buds must be cut when the buds are firmly united, but ties should be left intact as late as possible to prevent lifting of the buds after cutting. If there is any unevenness of the cuts on buds or stocks, lifting will readily occur after the ties are cut.

At times the fast swelling of young stocks will make it necessary to cut the ties before complete unions have occurred; in such cases it is advisable to retie the buds immediately.

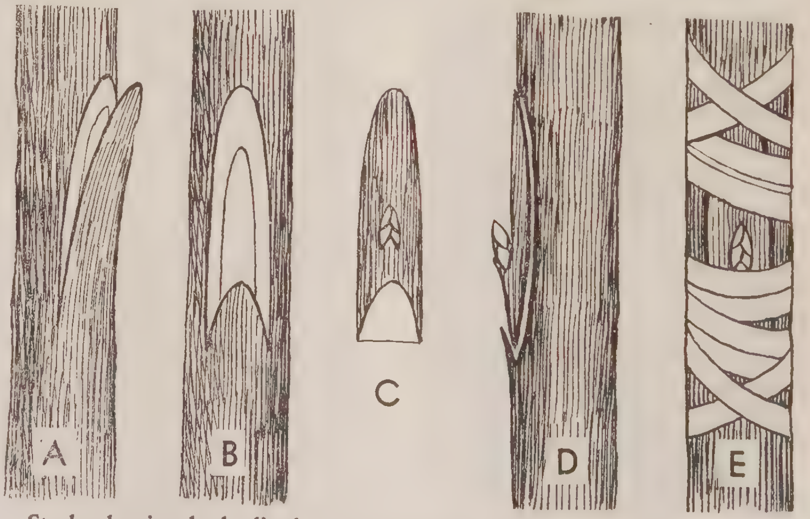
The plate method of budding has advantages over shield budding, particularly in time saved. The development obtained from shield budding in 12 months is obtained in 5 months by plate budding.

The risk of buds being killed by frost or winter conditions is eliminated by budding in the spring. This is particularly applicable to areas in the South Island where many buds are lost through these causes when shield budding is used. Another advantage of spring budding is that it is more convenient for orchardists who desire to work their own trees than budding in the late summer, when crops are being harvested.

In trials carried out in the Alexandra district during the spring of 1947 the following trees were successfully budded by plate budding: Apricot on peach, plum, and apricot stocks, peach on peach stock, plum on plum stock, and apple on apple stock.

It was found that loss of buds occurred readily when ties were cut too soon, and poor development resulted when buds were unevenly fitted. Where ties were left on for the maximum period and retying was done very good unions were made, and growth up to 4ft. 6in. from buds put on in early October was showing at the end of February.

Reference: Bulletin on budding and grafting, by J. S. Shoemaker and P. O. Hargrave, University of Alberta.



A—Stock, showing bark sliced. B—Stock ready for bud. C—Bud cut to fit B. D—Bud in position. E—Bud tied.

Investigation of Australian Soldier Fly in Opotiki District

HEADING PHOTOGRAPH

An excellent strike and establishment of maize were secured on this field, but the whole crop failed at a very early stage, apparently because of a severe infestation of the larvae of the Australian soldier fly. Some kumikumi and many weeds survived.

THE rich farmlands of the Opotiki district, in the Bay of Plenty, are widely known for their heavy yields of cob maize and for their high-producing pastures of ryegrass, white clover, and paspalum. Within the past few years, however, maize after lea has often been sickly, stunted, and low in yield, and some pastures have deteriorated sadly. The cause of this is thought to be the larva of an Australian soldier fly which is present in the soil at Opotiki but is not known to occur elsewhere in New Zealand.

By E. R. MARRYATT, *Fields Instructor, Whakatane.*

HOW this fly came to Opotiki and why it is confined to that locality are at present unknown, but the extent of its damage and ways of combating it are being investigated. There is no record of its having caused very serious trouble in Australia, where it is regarded as a minor pest of sugar cane, so alarmist reports about it should be treated with reserve pending investigation. There is no evidence in pastures of browning off or dying of plants such as is caused by the New Zealand grass-grub, and such evidence might be expected were the insect really a serious pest in pastures. On the contrary, because the fly goes through its larval stage insidiously sucking the sap from the grass roots, the damage to pasture production may still be severe but not as noticeable as that done by the root-devouring and soil-altering grass-grub.

Dr. D. Miller, Director of the Entomology Division of the Cawthron Institute, has identified the fly as *Metoponia rubriceps,* Macquart. A record of this fly at Opotiki by J. Muggeridge was published in 1944 in the "Journal of Science and Technology," Volume 26, number 4 (Section A), pages 190-192.

Description of Insect

The larva is biscuit to soil coloured except immediately after moulting, when it is a pale cream. It is sausage-shaped and up to 10 millimetres long. It has shallow grooves round its body and sparse hairs or bristles. The skin is very tough, feeling rather like rubber when a live larva is pinched between thumb and finger. The female fly is about the same length as the common house fly except when ready to lay, when her body is greatly extended but very slender. She has an amber-coloured head and knees and elsewhere is black. The male is shorter and entirely black. The wings are highly veined and the flight is rather slow and usually close to the ground.

An Australian entomologist, Irwin-Smith, states that two broods of the fly appear annually and that the larval stage exceeds six months and may exceed a year. In February and March empty pupal cases vertical in the soil with the open end flush with the surface have been found at Opotiki, and, as decomposition of these thin shells could be expected to be fairly rapid, emergence of the fly was assumed to have been recent. That was confirmed in April on subsequent visits, when many flies were observed on the wing and fewer larvae than formerly were found in certain soils where the larval population was known approximately. Odd flies were caught earlier in the autumn, and even in November, December, and January. Occasional ones have also been seen in motor-cars in the town of Opotiki when the cars had just arrived from other districts, which indicates an easy means of transporting the fly elsewhere.

Habits of the Larvae

The larvae or maggots are found usually within the top 2 or 3in. of the soil, where the roots of plants are most numerous. They may be found at greater depths in the early larval stages, and on the lighter soils of the Opotiki hills they may be found at greater depths than in the soils of the Opotiki flats. They appear at first to be immobile, but obviously can move about in the soil quite well by means of their segmented bodies and bristles.

Larvae have frequently been discovered adhering strongly to the roots of maize and pasture plants by their jaws, and from the point where they are attached to the tips the roots are plainly dead. Usually, however, breaking the sod to look for the larva disturbs and dislodges it from its exact position, so that all that can be seen is that the maggot is among the roots. Because it is also found distributed throughout the soil where, temporarily at least, there are no living plants, there is evidence to show that the larva does not live entirely or continuously on sap from living plants. How long it can exist without this support is not known.

The larvae have been found in large numbers on the light soils of the ridges near Opotiki and they also occur on some parts of the Opotiki flats. None has been found further away than about seven miles from Opotiki.

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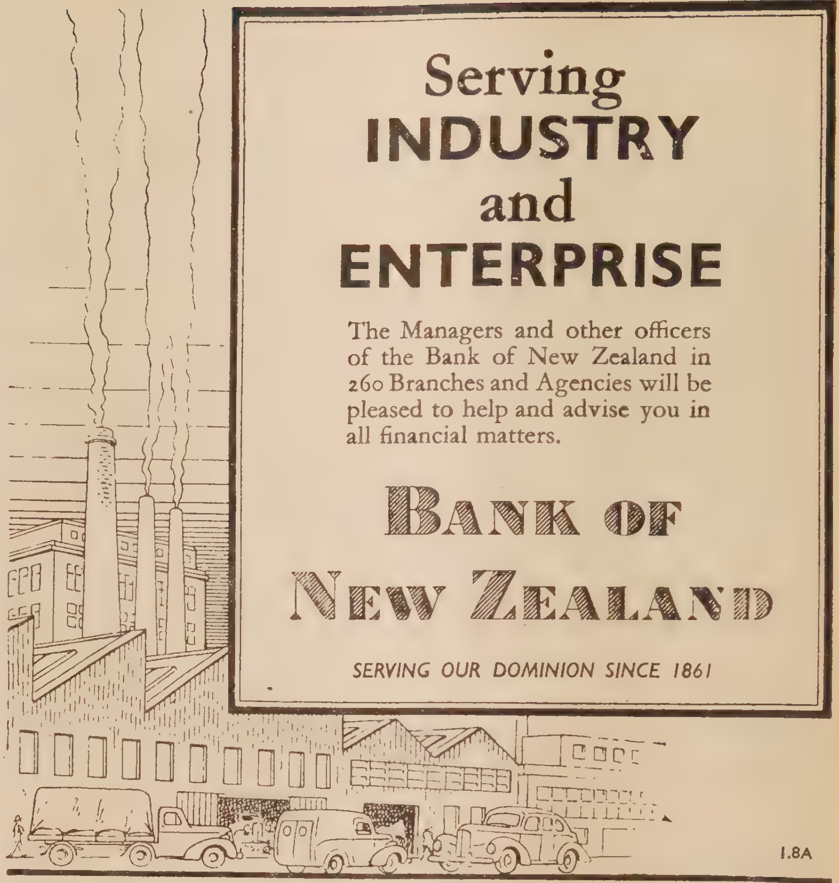

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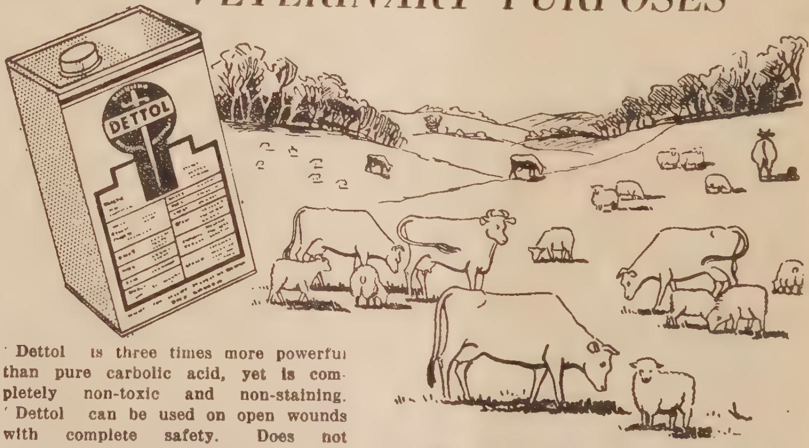

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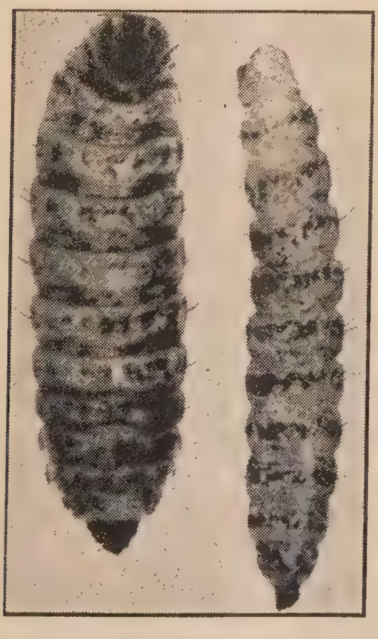
INVESTIGATION OF AUSTRALIAN SOLDIER FLY

An experimental maize crop at Kukumoa. In the early-ploughed area on the right strongly-growing maize is waist high. In the late-ploughed half of the field on the left the maize is weak.

Causes of Damage

Some farmers of this district now expect poor results from maize sown immediately after old pasture because of a high infestation of larvae in the soil. These farmers claim that better results are obtained in subsequent years. Apparently pastures are not seriously infested until after their fourth year down, when, it is stated, production is noticeably reduced. The fly mates, lays her eggs, and dies soon after their emergence, so tending to reproduce her kind in the approximate area of her own pupation. That may explain why the infestation of a pasture increases with its age. Very high larval counts of 300 to 400 to the square foot have been obtained in some of the oldest pastures. In a crop of sickly maize after old pasture two plants lifted and examined had 90 and 150 larvae among their roots.



Larvae of the soldier fly (about seven times natural size).

All failures of maize and other crops and all pasture deterioration at Opotiki are not attributable to the fly. Good crops of maize are still taken after old pasture on some farms. Some Opotiki farmers complain that crops from paspalum pastures which three or four years ago hid the fences when hayed are now not worth cutting; that is true, but continuous haying could cause it to happen, though the soldier fly may aggravate results of this kind of mismanagement. On well-managed pastures the fly may fairly take the bulk of the blame. The twin cress problem at Opotiki is probably partly caused by pasture deterioration which has been accentuated by the fly.

Official Investigation

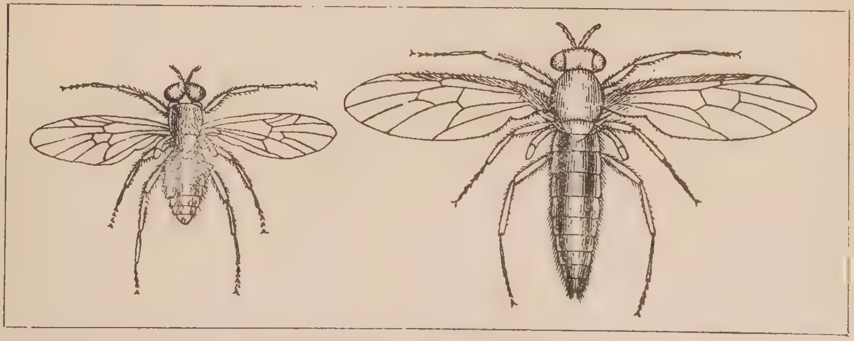
The alleged damage caused by the fly has been under investigation for some time by the Entomology Division of the Department of Scientific and Industrial Research in conjunction with the Fields Division of the Department of Agriculture. The aims of these investigations are to discover the extent of the damage and how to combat it.

In pastures the damage is difficult to determine, as it will probably be a slow change over several years. Falling-off in the production of a grazed pasture, though very noticeable to the farmer who has to find feed for his cows, is difficult for him to demonstrate to occasional visitors. Attempts to kill the larvae in plots on infested pastures and to compare the growth on maggot-free and maggot-infested pasture have failed so far because all the insecticides used either affected the growth of the pasture or failed to kill the maggot.

Experiments with Maize

Investigations into the damage caused by the insect on maize presented fewer difficulties and already have produced some interesting information. Mr. J. Baird, of Kukumoa Hill, made available for experimental work a field which was ploughed out of maggot-infested and badly-deteriorated pasture and sown to greenfeed oats in the autumn of 1947. The oats failed, apparently because of a high population of larvae in the soil. Half of this failed crop of oats was ploughed early and the other half was not ploughed until a week before being sown to maize—three months later. No cultivation was done during these three months because the weather was too wet. The strike and establishment on the two halves of the field were not noticeably different, but up to February the growth of maize in the early-ploughed half was much better than that on the late-ploughed half; from February onward that difference was not apparent. A comparison by weight of the yield of cobs on each half of the field at plucking time will be necessary to determine if the wide difference in growth in the first three months seriously affected the yield.

The maggot population was about 85 per cent. lower in the early-ploughed half. Certain insecticides



The male (left) and female soldier flies (about six times natural size).

FAILURE OF OPOTIKI MAIZE CROPS

Though this maize crop failed completely, the weeds benefited from the phosphate drilled in with the seed.

which were effective against the larvae on the late-ploughed half produced no apparent improvement in growth of maize on the early-ploughed half, as it was already growing to its capacity.

Four different and likely insecticides were used in the hope that at least one of them would kill the larvae without affecting the maize and so give a comparison of maize on maggot-free and maggot-infested soil. Two of these insecticides greatly reduced the larval population and on these plots the maize was at least 18in. higher than on the untreated plots on the late-ploughed half and similar in height to that of all the maize on the early-ploughed half. The same results were obtained in the three replications of the treatments.

Because of their high cost the insecticides used in this trial are not a practical solution to the problem, and great interest is therefore being taken in the good results from early ploughing in reducing the maggot population. How this has come about is not known, but the objective was to attempt to kill the maggot by starvation and exposure to birds.

A check-up on maize crops grown in the first year after grass around Opotiki this year has tended to confirm that where the land was ploughed out of grass at least three months before being sown to maize the grub has caused little damage. However, very few farmers had ploughed as early as that. One farmer reported that early ploughing failed to give him satisfactory results some years ago. About 25 per cent. of these first-year crops were failures and about 15 per cent. partial failures this year. The larval population in Mr. Baird's field in which the experiments were carried out was of medium intensity. There was stunting but no deaths of plants, as there were in many other crops in the locality.

Results of Investigations

Investigations to date have revealed that *Metoponia rubriceps* is a serious pest of first-year maize at Opotiki, causing in 1947-48 at least a 25 per cent. loss of first crops of maize after grass. Other crops known to be severely affected are green cereals and kumikumi. No exact information has yet been obtained about how serious the pest is in grassland at Opotiki.

An indication that the insect may be controllable by cultural methods has been obtained, but the prospects of controlling it chemically are not bright. Investigations are continuing.

Farmers are recommended to plough infested pasture at least three months before sowing to any other crop. A summer fallow and cultivation with light tine harrows are likely to be even better, as larvae may then be destroyed by drying out or by insect-eating birds.

Acknowledgments

The pioneering work of certain local farmers who discovered the maggot to be the cause of some of their troubles and who persisted in endeavouring to secure official investigation is acknowledged. These men—Messrs. L. Holman and T. I. Steel, and an Opotiki chemist, Mr. J. D. Clark—deserve the thanks of Opotiki farmers and of the writer.

Special Weather Forecasts for Farmers

UP-TO-DATE weather information is most important to the farmer at such times as shearing, haymaking, and lambing, and though a check can be kept by listening to the regular broadcast forecasts, these are often not sufficiently specialised to meet individual needs. Such needs are best met by a request telegram to "Weather," Wellington (the telegraphic address of the Meteorological Office), which will receive the attention of the forecaster.

It should be realised, however, that these telegrams should reach "Weather," Wellington, early enough to ensure that a reply is not delayed by closing of the local telegraph office or any other contingency. The reply will be brief and sent "collect." There are many kinds of telegrams that may be sent according to the needs of the farmer concerned, but in all cases farmers would materially assist the forecaster by giving the actual dates for which the forecast is required and the particular kind of weather, which is of special importance; for example, strong winds, rain, snow, or cold changes. It would also be very helpful if the nature of the operations being undertaken could be briefly indicated; for example, shearing, haymaking, or lambing.

In cases where the name of the telegraph office of origin does not give an adequate indication of the situation of the farm, a brief note on location is useful. This is clearly important if the farm is near mountain ranges or is at a considerable altitude.

Telegrams Should be Explicit

It will be realised that it is hardly possible to give a brief reply to a telegram reading: "Please send weather prospects next few days. Smith, Tauranga," as "weather prospects" does not indicate the particular weather elements which are important and the time period is only vaguely indicated as "next few days." It would clearly lead to a more definite and more concise reply if the telegram were worded: "Please send prospects for rain 15th and 16th. Smith, Tauranga." In this case the reply could be simply: "No rain expected. Weather."

Another type of request which is often used to safeguard farming operations is that requiring information to be sent under certain specified conditions, as in the following: "Please send warning of cold changes during December. Cloudy Valley, altitude 5000ft. Jones," or "Please advise when three days without rain are expected. Smith, Tauranga."

The period of validity of most weather forecasts is normally taken to be 24 to 36 hours, and though under favourable weather conditions this can sometimes be extended up to three days, any longer period must be regarded as too uncertain for practical use.

When asked for longer-period forecasts, forecasters generally will give as long as is reasonably certain and then indicate the uncertainty of the remaining period in the telegraphic reply. For example, in reply to a telegram reading: "Any rain Monday to Saturday," the reply could be: "No rain Monday, Tuesday, Wednesday—uncertain thereafter."

For their part, farmers can give considerable assistance to the Meteorological Office by forwarding details of peculiarities in weather in their district, which can then be investigated.

"DOUBLING UP" THE MILKING MACHINE

By W. G. WHITTLESTON, *Physical Chemist, Animal Research Station, Ruakura.*

AT present, when building materials are scarce and the extension of existing milking sheds is a difficult problem, it is often necessary to "double up" all or part of a milking machine to handle an increase in the herd. The following article is intended as a guide to the practical farmer who is confronted with the need to increase his shed capacity without using any building materials.

THE most important factor in the doubling of a milking machine is the effective capacity of the vacuum pump. The real capacity of the vacuum pump is controlled by the following factors:—

1. **Size of pump:** Naturally the larger a pump the greater its capacity.

2. **Speed of pump:** The faster a pump is driven the more air it displaces. This is not a proportional relationship, however, as with increased speed the efficiency of the pump tends to fall. Different makes vary in this respect, while different grades of oil affect the result.

3. **Leaks:** (a) Within the pump—Any excessive clearances in the pump may be regarded as air leaks in the system. A pump with worn blades simply lets air leak back into the vacuum tank from the exhaust pipe. The real capacity of the pump is reduced by this leakage. (b) External—All leaks in the plant reduce the effective capacity of the pump.

4. **The sensitivity of the relief valve:** While the machine is operating at the correct vacuum with air passing into the relief valve this factor is not important. However, as soon as an increase in demand on the air displacement of the pump occurs, with a resultant fall in vacuum, the relief valve should close promptly, otherwise the air passing into the plant via the faulty valve is reducing the real capacity of the pump. In other words a relief valve which through any cause does not close when the vacuum falls by about 1in. of mercury is acting as a leak. Conversely, the relief valve must be capable of handling enough air to prevent high vacuums when the machine is milking only a few cows.

5. **The pulsators:** The air requirements of the pulsators must be subtracted from the capacity of the pump to get the displacement available for actual milking. It is evident that the faster a pulsator works the more air it will consume. The number of cups also controls the air consumption of the pulsators.

6. **The size of the plant:** Obviously, the bigger a plant the larger the pump capacity required to operate it. This is not a simple proportional factor, as the small plant has a releaser which consumes air in excess of the demands of a set of cups and which is not usually strictly related to the size of machine. Further, there are inevitable leaks round the releaser which are greater than those found in pipe joints and round bungs. Hence the overall effect is that the small plant requires more air per set of cups than the large plant.

Testing Effective Capacity of Pump

It has been found at the Animal Research Station, Ruakura, that the most convenient approximate test for pump displacement is the measurement of the vacuum a pump can pull against a ¼in. hole when the relief valve is screwed up or otherwise put out of action. This test is carried out with the pulsators going. (For further details see the Department of Agriculture's Bulletin No. 260.) Using a chart or a calibrated gauge the displacement of the pump available for milking is read off and divided by the number of sets of cups. The resultant figure gives a working basis for checking the above factors influencing pump capacity. (N.B.—Sometimes where the displacement is low excessive leaks develop round the releaser components as the vacuum pulled is not great enough to seal the rings.) For single plants the following table gives the relation between size of plant, pump speed (for standard 7in. x 6½in. rotary pumps), and the vacuum produced against a ¼in. orifice when the relief valve is shut off:—

Size of plant (bails)	Pump speed (r.p.m.)	Vacuum (in. mercury)
2 ..	.. 200	3.4
3 ..	.. 235	6.6
4 ..	.. 260	9.8
5 ..	.. 270	12.7
6 ..	.. 290	15.0

The use of this table is illustrated by the following example:—

A 4-cow plant is checked over and the pump, which is a standard rotary, is found to be running at 220 r.p.m., while the effective air displacement is very low. The pump is brought up to 260 r.p.m., but still the vacuum drawn against the ¼in. hole is only 6in. of mercury. A check of the pump lubricators shows that there is a blockage and not enough oil is getting into the pump. This is fixed with a resultant increase in the vacuum produced against the ¼in. hole to 7½in. Finally, a search for leaks, using a lighted match or a candle, shows that several pipe joints leak and need new rubber rings. When the leaks are fixed the test shows a vacuum of 10in., which is adequate for a 4-cow, single-bail plant.

General Considerations

Experience in the field, together with a certain amount of experimental work, have led workers at Ruakura to the conclusion that for most practical purposes the doubled plant should be treated as the original, plus half as many bails again—a 4-cow, doubled plant should be treated as a 6-cow plant; a 6-cow, doubled plant as a 9-cow plant, and so on. That means that the units common to all the bails must be treated on this basis so that when a 4-cow plant is doubled the pump, releaser, etc., must be of adequate capacity for a 6-cow, single-bail installation.

Pump Capacity

In testing a single-bail plant for air displacement research work at Ruakura has led to the conclusion that a figure of 0.06 cu. ft./second/set of cups, over and above the pulsator requirements, is a practical minimum. A similar test on a doubled plant should show a minimum of 0.04 cu. ft./second/set of cups. When a plant has been doubled the pump speed must be increased to that recommended by the makers for a machine half as big again as the original, and the air-flow test should meet the above requirements. If all joints are air-tight and all flaps seating correctly, and the air flow is not satisfactory, the pump may need overhauling or a larger one may have to be installed. Unfortunately, no general rules can be laid down for the use of "super" pumps as there is no standard of performance. (Work in this connection is being carried on at present at Ruakura.) Hence, when a super pump is used the only check on its suitability is the air-flow test described previously.

As a rough guide it may be noted that the 8-cow plant at Ruakura is operated satisfactorily by a well-known make of super pump running at 260 r.p.m.

The Releaser

The releaser should be considered in the same way as the pump. If a 6-cow plant is doubled up, the releaser used should have milk-handling capacity sufficient for a 9- or 10-cow plant.

The Milk Pipe

At present there is no accurate information available on the optimum sizes of milk pipe for various milking-machine capacities. It would appear to be good policy to use 1½in. milk pipe for plants of 6-cow capacity or more, changing to 1¾in. for 10- or 12-cow units. Following the general rule of adding half as many bails to the single plant for the purposes of calculating the requirements of the doubled machine, that means that a doubled 4-cow plant should have a 1½in. milk pipe while a doubled 8-cow machine needs a 1¾in. pipe.

The Air Pipe

The air pipe need not be altered when doubling up. The extra pressure drop due to air flow in the normal 1in. or 1¼in. pipes when a plant is doubled may be disregarded.

The Bail Installations

1. **Pulsator connections:** The most economical way to double the pulsator is to use a Y-tube at the bottom of

"DOUBLING UP" THE MILKING MACHINE . . .

the dropper. There is no objection to using one valve and one dropper for the pulsator, as this arrangement has no effect on milking efficiency. Similarly, where one pulsator valve serves more than one bail it has been found at Ruakura that there is no difficulty in doubling the connections. One valve port may supply four sets of cups satisfactorily, which means that one double-port slide pulsator can be used to operate a 4-cow, doubled plant.

2. **Milk connections:** The milk connections for each set of cups must be quite independent. A separate sight glass should be installed (on the milk pipe for preference) and independent droppers used. The reasons for this are:—

(a) A common dropper causes excessive choking and consequent drop in vacuum at the cups.

(b) With a common dropper and sight glass it is not possible to determine which cow is still milking.

(c) With a common-dropper arrangement there is a fair chance of milk from a cow infected by mastitis organisms travelling back into the other set of cups in the bail toward the end of milking. A common dropper may, therefore, help to spread mastitis. The effect is reduced by the use of a common interceptor, but the writer favours the use of independent droppers as being the safest procedure. In any case the common interceptor does not deal with choking in the single dropper.

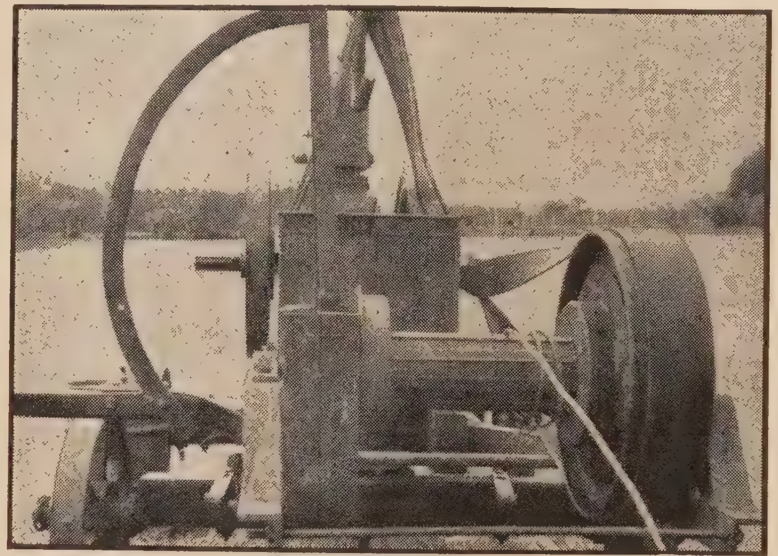
3. **The phasing of pulsator valves:** In the case of a 4-cow plant which has all of its pulsators squeezing in unison (an undesirable arrangement) it is essential on doubling up that half the valves be arranged to squeeze while the others release. A doubled plant with all the pulsators working together gives a great swing in vacuum with consequent reduction in the efficiency of the relief valve and the pump.

Summary

The chief requirements in doubling up a milking plant may be summarised as follows:—

1. Check the vacuum pump speed and increase it to the correct value for a plant half as big again. Check the air flow after the installation has been doubled as described in the Department of Agriculture's Bulletin No. 260.
2. Check the relief valve to see that it works; remove all causes of leaks.
3. Make sure the releaser is big enough. A doubled, 6-cow plant requires a 9-cow-plant releaser, a doubled, 4-cow plant a 6-cow single releaser, and so on.
4. A 4-cow, doubled plant requires a 1½in. milk pipe; an 8-cow, doubled plant a 1¾in. milk pipe.
5. Pulsator connections should simply be doubled with a Y-tube at the bottom of the dropper.
6. Milk connections should be completely doubled from the cups to the milk pipe.

Elevator Winch to Replace Horse



WITH the complete mechanisation of many farms difficulty is often experienced in finding a suitable horse for working in the elevator when hay or silage is being made. The unpopular task of leading the horse has been eliminated on some farms by using a stationary engine and winch. The making of a suitable winch, as used by Mr. L. L. Cook, Hinuera, South Auckland, can be undertaken by a handy man, but some welding may have to be done by a tradesman.

The winch consists of a shaft mounted on bearings, a pulley, a winding drum, a clutch, a brake, and a lever. The 2ft. diameter pulley is fixed to one end of the shaft but between the bearings. The winding drum, resembling a cotton reel, runs loose on the shaft and was made from several 6in. pulleys and two brake drums from an old car, held together by welding iron straps between them. The face of the brake drum next to the pulley wheel is lined with belting to form a clutch plate, and the brake consists of a block of wood against which the other brake drum rubs when required. The winding drum thus runs between the pulley wheel and the brake block and has about ½in. end play.

The lever is attached to a loose collar on the shafting and when lifted moves the winding drum against the pulley wheel, causing the drum to revolve and wind up the wire rope, so hoisting the load. When the required height is obtained a downward pressure on the lever disengages the clutch but applies the brake, thus allowing the load to be held at the desired height until the grab is released. To lower the grab the brake is released slightly, and the lever is so weighted that the empty grab is held in any position without attention from the operator.

The winch illustrated is driven by a 6-horsepower engine, but a 2½-horsepower engine is ample, requiring about 2 gallons of petrol a day between milkings.

—*G. A. BLAKE, Instructor in Agriculture, Matamata.*

Radio Broadcasts

RADIO broadcasts to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates.

September 6—"Current Farming Problems," by J. E. Bell, Fields Superintendent, Auckland, A. J. Kerse, Fields Instructor, Auckland, and H. Woodyear-Smith.

September 13—"Common Ailments of Calves," by D. M. Corbett, Veterinarian, Department of Agriculture, Whangarei.

September 20—"Some Problems of Weed Control," by R. K. Ward, Agricultural Chemist, Soil Fertility Research Station, Hamilton, and E. B. Glanville, Assistant Fields Superintendent, Auckland.

September 27—Young Farmers' Clubs session, by a member of the Kaitaia Y.F.C. district committee.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.35 p.m. and Thursdays at 7.15 p.m.

Farm news sessions are broadcast over main national stations every Thursday at 9.20 p.m.

Care of Young Fruit Trees Essential For a Profitable Orchard

By I. L. BROWN, *Orchard Instructor, Hamilton.*

THE necessity of giving the required amount of attention to newly-planted fruit trees is often not fully appreciated, and the failure of many trees to produce the crops expected can often be traced to checks suffered through mismanagement during their development. Because fruit trees become a comparatively permanent feature of garden or orchard, no phase of their culture should be neglected.

YOUNG trees should be encouraged during their first few years of life to make strong growth and develop a sturdy framework capable of carrying good crops when they reach the age of steady fruiting. To ensure the attainment of this required growth the conditions under which the young trees have been and will be required to grow should be examined and remedial measures instituted if necessary.

Site of the Orchard

In many instances it will be found that the trees have been planted in an unsuitable situation. The ideal is, of course, in a well-sheltered position free from late frosts, receiving the maximum sunshine, and with a deep, well-drained, loamy soil of good moisture-holding capacity. Such a location is not always available, however, and where trees have had to be planted in less desirable surroundings the conditions under which they are expected to grow should be examined.

Young trees planted too close to other and perhaps larger trees will be overshaded and robbed of much nourishment from the soil, which would have a deleterious effect on their development. This is often the case with plantings made among old-established trees it is desired to replace. The young trees will never be successful under these conditions, and the old trees should be removed to allow the replacements full advantage of the sunlight and a free rooting area. In most districts at least 16ft. should be the planting distance and in districts where growth is strong up to 20ft. is not excessive for commercial plantings. Closer planting is permissible in home orchards, where space is often limited.

[*National Publicity Studios photo.*

Only trees encouraged in their first few years to develop a shapely and sturdy framework will be capable of carrying good crops when they reach the stage of steady fruiting.

[*National Publicity Studios photo.*

Cultivation round fruit trees should be sufficient to keep weed growth to a minimum and the surface soil open and friable, as in this orchard in Upper Moutere, Nelson.

Use of Shelter

However, the desire to keep young trees away from competing growth should not lead to their being planted so far away from any natural or artificial shelter that it becomes of little value. Fruit trees exposed to strong or cold winds will not thrive, and they should be sheltered, but without interfering with their growth. They should be planted at least 20ft. away from wide-spreading hedges, but when the hedges are not of a spreading habit, such as those in domestic orchards in cities and towns, the distance need not be so great.

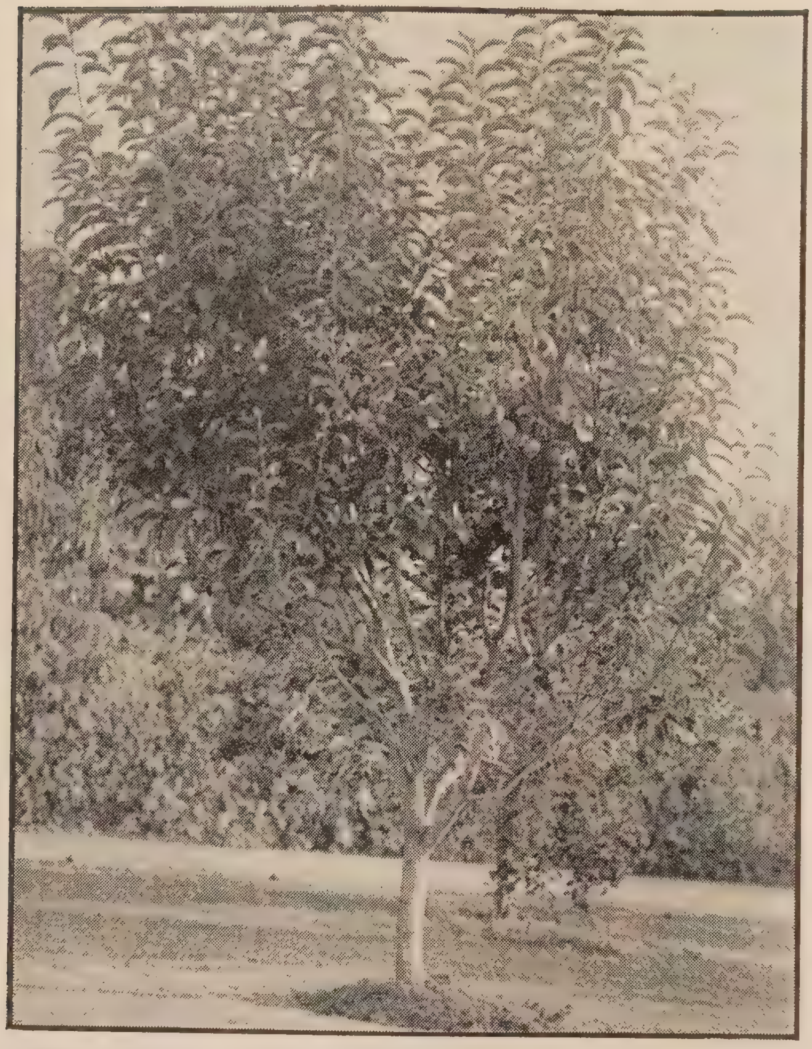
Drainage of Excess Water

After shelter round the selected or established orchard site has been examined drainage should receive attention. Fruit trees will not tolerate "wet feet," and though it is important that soil moisture should be sufficient to maintain growth, it should never be allowed to become excessive. Presence of excess water in the soil prevents efficient aeration and restricts root activity, and where water lies, even if only for a short period, within the rooting area of a tree many or all of the fine rootlets will be destroyed and growth of trees affected. Both in commercial and domestic orchards, therefore, excess water should be eliminated. The most efficient drains are made with tiles or pipes, but boulders and scrub are satisfactory drainage materials. (A variety of drainage systems suitable for the home orchard is illustrated in "The Home Garden in June" on page 449 of the May, 1948, issue of the "Journal.")

Soil Requirements

If site and surroundings are considered suitable, other factors which may be retarding growth should be considered. Few soils are able to supply all the elements required by plants for maximum growth, and addition of plant foods to the soil may be necessary. The required nutrients include nitrogen, phosphorus, potassium, calcium, sulphur, magnesium, sodium, iron, chlorine, and silicon, all but three of which—nitrogen, phosphorus, and potassium—are usually present in most soils in sufficient quantities for plant growth. Deficiency of nitrogen is likely to limit growth of young trees, as development of young growth and leaves is mainly dependent on nitrogen. Phosphorus (or phosphoric acid, the form in which it becomes available to plants) is also important, as it aids

CARE OF YOUNG FRUIT TREES



A young apple tree well situated in a domestic garden. Note the mulch round the trunk.

both root and fruit bud development. Potash or potassium is also essential, because it assists in the formation of the fibrous matter of plants, as well as being beneficial in the fruiting stage.

These elements may be supplied to soil, and thus to trees, in various ways. One of the simplest methods, and one often overlooked, is by building up the humus content of the soil. This not only adds plant foods, but also improves moisture-holding capacity and assists in the prevention of soil erosion in orchards on slopes. Many soils are lacking in humus, but it can be added very simply by the use of cover or green crops and compost. The growing of green cover crops is perhaps more suited for commercial orchards and the use of compost for trees in domestic gardens.

Cover Crops

Cover crops, whose suitability is governed by district and condition of soil, are mustard, rape, barley, field peas, vetches, oats, tares, red clover, and blue lupins. Leguminous plants are particularly valuable because they add nitrogen to the soil. Cereals form a good amount of humus when turned under and their high fibrous content is of great benefit in keeping heavy soils open and friable. Potassic and phosphatic manures applied with seed at time of sowing ensure a good bulk of green crop and enrich the soil at the same time.

Cover crops should not be sown so close to trees that they interfere with their growth. Herbage growing too closely round young trees will deter rather than aid them, as competition for plant nutrients is intense and the trees may be robbed of much-needed food. It is best, therefore, to keep the rooting area round trees free from other growth, and in young orchards cover crops should be sown so that a clear strip 2 or 3ft. wide is left along each row. In home orchards cover crops may be grown on a separate area and cut and carried on to the ground to be manured. This allows the clear ground round the tree to be kept cultivated and leaves space for working round the tree.

Artificial Fertilisers

Artificial fertilisers can also be used to advantage, and if farmyard or stable manure is available, a well-rotted mulch of it worked into the soil will be beneficial.

If young trees are growing strongly, little artificial manure need be applied, but if growth is not all that is desired, an application of some fertiliser is advisable. Though nitrogen is the one of the three main plant foods, phosphorus, potassium, and nitrogen, which is most likely to be lacking in soils, the others are also essential, and manures used in the orchard should not be wholly nitrogenous in nature. Balance of the elements should be maintained when applying manures, and if sulphate of ammonia or nitrate of soda is used, application of phosphate and potash should not be neglected.

Type of soil, rainfall, previous treatment, and other factors govern fertiliser applications, but an annual application of a mixture of blood and bone (nitrogen and phosphorus), superphosphate (phosphorus), and sulphate or muriate of potash (potassium) at the rate of several pounds to each tree is generally advantageous. The mixture may vary, but there should be at least 2 or 3 parts of blood and bone to one part of the others. Sulphate of ammonia, a fertiliser rich in nitrogen that becomes quickly available to plants, may also be included in the mixture; it is suitable for applying to the soil during the growing season if trees are not making satisfactory growth. The following table from an article "Maintenance Work in the Home Orchard" by R. G. Hamilton in the July, 1947, issue of the "Journal" shows recommended rates of application of fertilisers per tree:—

	Rich soils (lb.)	Average soils (lb.)	Poor soils (lb.)
Apples, Pears, and Apricots			
Sulphate of ammonia	—	1	1½
Superphosphate ..	2	2	2½
Blood and bone ..	2	2	2½
Sulphate of potash	1	1	½
Totals ..	5	6	7
Peaches, Plums, and Nectarines			
Sulphate of ammonia	½	1½	2
Superphosphate ..	1½	1½	2
Blood and bone ..	2	2	2½
Sulphate of potash	1	1	½
Totals ..	5	6	7

These applications may be increased up to 15lb. per tree as the trees increase in size and bearing capacity.

Lime should also be added to orchard soils, as in many districts, particularly where rainfall is high, lime content may be low. Lime applied round young trees, besides adding calcium to the soil, is valuable in correcting acidity, improving tilth of heavy and clay soils, and in assisting the nitrification of plant foods in the soil.

In applying lime either of two methods can be recommended:—

1. Applications of up to 30cwt. to 2 tons (11 to 15oz. per square yard) to the acre every two or three years, or
2. Light annual dressings of 10cwt. to 15cwt. to the acre (3¾ to 5½oz. per square yard).

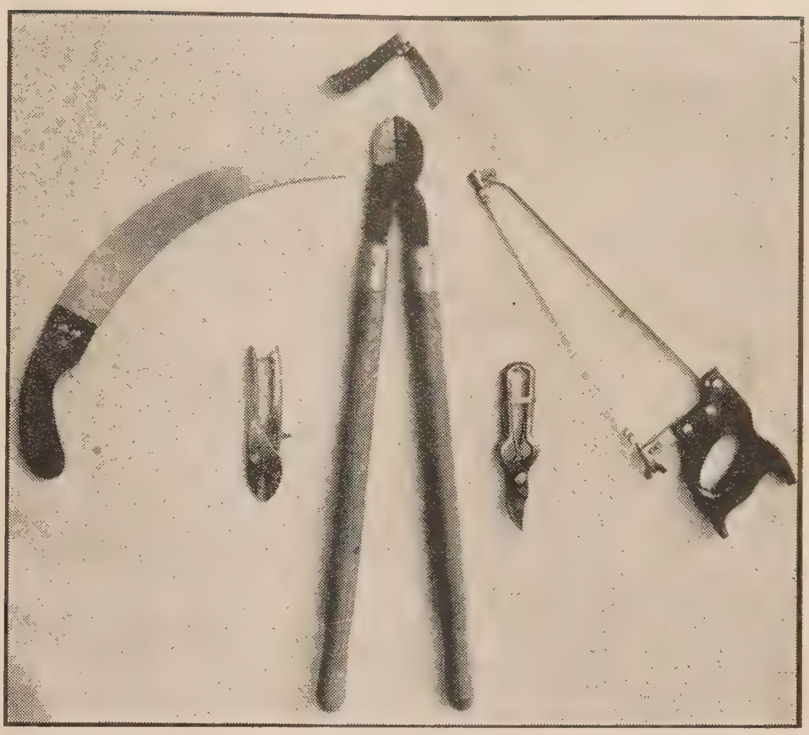
Method 2 reduces the possibility of over-liming and thus building up excess calcium in the soil, which often results in a fixing of other nutrients and makes them unavailable to plants.

Orchard Cultivation

Neglect or excess of cultivation may also affect young trees. In districts with hot, dry summers, and particularly where the soil is light, excessive cultivation powders the soil and destroys its humus content, depriving plants of much valuable nutrition. It also renders soil liable to erosion during heavy rains and winds. Much valuable moisture is also lost to trees when finely-tilled soils cake and crack after rain.

Neglect of cultivation, on the other hand, has similar evils, and though the soil is not destroyed in the same manner, it is prevented from working to support the tree. Untilled soils require much more moisture to sustain good growth, they have poor aeration and hence limited activity of nitrifying bacteria, they allow weeds and other herbage to develop, and they pack hard, thus allowing rain to run off rather than penetrate to the deeper roots.

Cultivation should be sufficient to keep weed growth to a minimum and the surface soil open and friable, without leaving it in coarse, hard lumps or too finely powdered. Very deep ploughing or discing should be avoided, particularly within the rooting area of the trees, as damage to some of the roots may occur with resultant deterioration of the upper parts of trees. Endeavour to till soil close to tree trunks with horses, tractors, and other implements may also cause damage to branches and laterals.



A good range of pruning tools is essential for the maintenance of trees in good order. Illustrated are suitable saws, secateurs, and a pruning knife.

Trees can be given the full benefit of a rooting area free from competing growth by working the soil immediately round the trunks with a hoe or long-handled shovel. Though turning under or removal of heavy weeds and grasses in this way necessitates hand work, it enables a good tilth to be maintained right up to the trunks.

Pruning Programmes

Faulty pruning may also spoil young trees, which should be trained to correct faulty habits of growth and to form a good, permanent framework. Trees left unpruned from the time of planting produce long, thin, upright leaders or branches close together and particularly weak at the top. This results in a loss of stability, and when heavy fruiting begins the tree is unable to support the crop and breaking and splitting of the limbs occur. A tree pruned regularly and with understanding has stable leaders well furnished with sturdy laterals capable of carrying heavy crops without propping to prevent breakages. As a general guide in pruning, leaders of strongly-growing young trees should be cut back about a quarter of their length, those of trees of intermediate vigour to about half, and weak growths to a quarter or less.

Period of application	Treatment	Quantities with water to make 4 gals. of spray	Diseases controlled
	Apples and Pears		
1. Dormant	Winter oil 5%	1½ pints	Scales, woolly aphis, red mite
2. Green tip	Bordeaux 5 : 4 : 50	6½oz. bluestone 5¼oz. hydrated lime	Black spot
3. Every 2 or 3 weeks after leafage has developed ..	Lime sulphur 1 : 100	6½ fl. oz.	Powdery mildew
	Stone Fruit		
1. Dormant	Winter oil 5%	1½ pints	Scales, red mite, green aphis
2. Movement of leaf buds ..	Bordeaux 5 : 4 : 50	6½oz. bluestone 5¼oz. hydrated lime	Leaf curl, shot-hole
3. Every 3 or 4 weeks after foliage has developed ..	Bordeaux 3 : 4 : 50	4oz. bluestone 5¼oz. hydrated lime	Leaf curl, shot-hole

Annual pruning is done in winter, between leaf fall and bud movement, but summer pruning is also of advantage to young trees. Examination of trees during the growing season will often reveal unwanted tendencies in young laterals and leaders, such as wood growing in the wrong direction or in a manner which might spoil the future framework. Removal of such growth is simple during summer and will greatly reduce the amount of pruning required in winter. It should be remembered, however, that pruning alone will not force young trees into growth unless soil fertility is kept to the necessary standard.

Disease and Pest Control

Another phase of management often neglected is control of diseases and pests, which weaken many young

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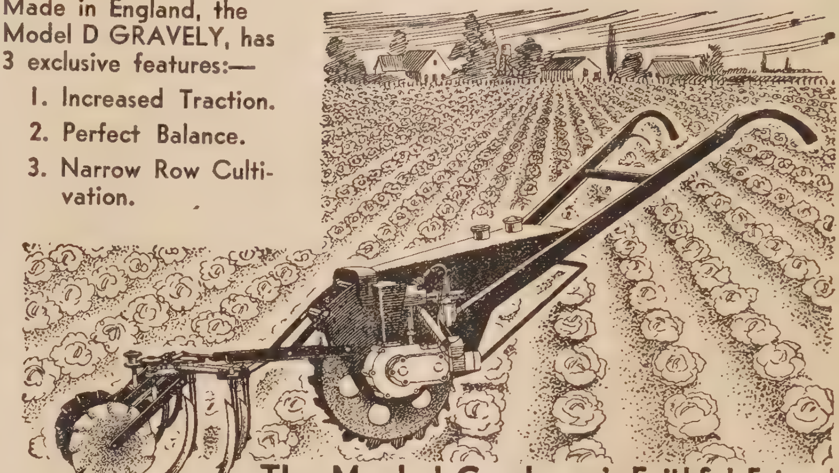

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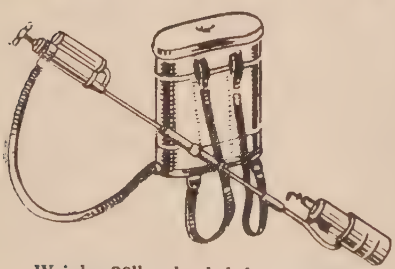

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trees. All ailments of older trees may be contracted by young trees, but adherence to a spray schedule which need not always be as complete as for trees in full bearing will prevent infection.

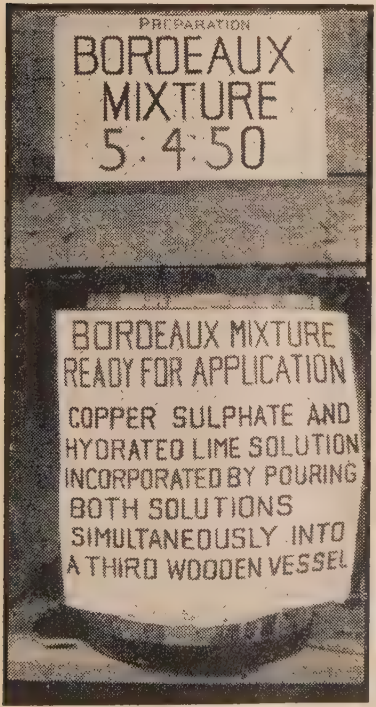
Suitable spraying programmes appear in tables on the previous page and the illustration below shows the method of preparing Bordeaux mixture.

If bronze beetle or pear slug becomes active, arsenate of lead can be added to No. 3 (1oz. plus 2oz. hydrated lime to 4 gallons of mixture). These pests can also be controlled by D.D.T. sprays or dusts, which are particularly effective on young stone-fruit trees, the foliage of which is subject to injury from sprays containing lead arsenate.

For red mite and spider infections during summer, summer oil should be applied at the rate of 6½ fluid ounces to 4 gallons of water. If this spray is applied within 10 days of a sulphur spray, damage will be caused to the foliage.

If green or black aphides become active, nicotine sulphate should be applied at a strength of 1 pint to 100 gallons of water (4/5 fluid ounce to 4 gallons). If nicotine sulphate is the only spray being used, 3 to 4lb. (2 to 2½oz. to 4 gallons) of soft soap should be added as an activator, but if it is combined with other sprays, soft soap is not necessary and may even be harmful.

Young trees should also be protected from other pests such as rabbits and hares. The provision of a suitable fence to keep these pests away is the most satisfactory method, but individual trees and blocks of trees may be safeguarded by the use of repellants. Two suitable preparations are:—


PREPARATION
BORDEAUX MIXTURE 5:4:50
BORDEAUX MIXTURE READY FOR APPLICATION
COPPER SULPHATE AND HYDRATED LIME SOLUTION INCORPORATED BY POURING BOTH SOLUTIONS SIMULTANEOUSLY INTO A THIRD WOODEN VESSEL

CARE OF YOUNG FRUIT TREES

[*Sparrow Industrial Pictures Ltd. photo.*

Spraying for the control of pests and diseases is a major operation in fruit tree culture, and adherence to a strict time schedule and the thorough application of sprays with efficient equipment are essential to success.

1. **Sulphonated oil,** which is prepared by heating linseed oil until it is smoking hot and immediately adding flowers of sulphur, one part of sulphur to nine parts of oil, by weight. Sift the sulphur slowly into the hot oil and stir it until all the sulphur is dissolved. The mixture will become hotter as this is done. When it cools it is ready for applying to the trees with a brush. It may also be thinned with turpentine or clear petrol until it is of a suitable consistency for application by spraying.

2. **Resin and alcohol,** which is made by dissolving 12lb. of finely-crushed lump resin in 4 gallons of commercial alcohol. Lump resin is essential, as powdered resin contains materials that will not dissolve. The resin is added slowly and stirred until completely dissolved. Stand the solution for 12 hours and then store it in an airtight container to prevent evaporation of the alcohol. When applying the mixture to trees make sure that the bark is completely dry or the solution will flake off. This compound is very inflammable and should be kept away from naked lights or heat.

Success in the culture of fruit trees involves three major operations, spraying, pruning, and soil management, and attention to all other minor operations likely to affect growth and fruit production. All are interdependent, and lack of care in carrying out any of them will greatly reduce future value of the trees or orchard.

FARM WORK FOR SEPTEMBER

By the Fields Division.

ROLLING OF PASTURES

Heavier soils such as those of the Hauraki Plains, Manawatu, and part of Southland, where the land tends to poach badly during winter and early spring, can be improved considerably by rolling with the Cambridge roller while the land is still soft. Winter poaching, if not corrected, results in the soil drying out and leaving a most uneven surface which is difficult for stock and damaging to farm implements. Further, the opening of the sward leads to the introduction of undesirable plants such as buttercup, pennyroyal, rush species, and inferior grasses. Thus the pasture is greatly weakened and its productive capacity reduced.

If areas subject to poaching are rolled and then spelled for a fortnight or so, the broken turf is reunited, with the result that a continuous sward of better grasses and clovers is established and weeds have no opportunity of invading the pasture. To be fully effective rolling must be carried out while the land is still soft. It should be remembered that only a very light roller should be used and the work should start as soon as it is possible to operate a tractor on such country. Light rolling while the land is still soft does not compact the soil, but simply "irons" it out, reuniting the turf, enabling wind and sun to deal more effectively with surface moisture, and leaving the surface in a favourable condition for stock and implements. A spell of two or three weeks after such rolling is desirable before the paddocks are restocked. In the past there has been far too little use of the roller in the spring management of pastures.

CHAIN HARROWING TO SPREAD MANURE

During September there will be great activity on dairy farms as herds approach full production, and many fields will be under concentrated grazing, which will lead to heavy accumulations of animal droppings on the sward. These should be spread at regular intervals, and preferably immediately after grazing. As every precaution should be taken to avoid breaking the turf in view of the approach of hotter, dry weather, only light chain harrows should be used in spring. The fact that droppings are soft should not deter farmers from carrying out chain harrowing, because even if manure is smeared over the field, the combined effects of showers, sun, and wind will clean the sward.

HAY AND SILAGE

Provision should be made for setting aside adequate areas for hay and silage. In general the quantities of these materials made each year are barely adequate to meet normal demands, and in time of emergency such as drought, flood, or crop failure stock suffer considerably. An endeavour should be made to build up reserves of at least one year's supply rather than to budget for a normal period of shortage, and September is a suitable time to lay the foundation of this policy.

As fields can be spared they should be shut up, but before being closed they should be chain harrowed to spread droppings, rolled if uneven through poaching, and topdressed where fertiliser is available. Any material such as loose wire, stones, and branches which at a later stage may obstruct implements should be removed.

Every opportunity should be taken to complete the overhaul of harvesting equipment. The replacement of temporary repairs done last year, the renewal of worn parts, sharpening and adjusting of cutting gear, overhaul of couplings, etc., are all of primary importance in ensuring a smooth run during the rush period. Frequently harvesting is done with one eye on the weather, so that a stoppage of even a few hours through faulty equipment may lead not only to the loss of a considerable part of a crop, but also to a considerable loss in effective labour through a gang of men being held up.

SUPPLEMENTARY CROPS

Cultivation of ploughed land for crops such as pumpkins, maize, and roots should be done as conditions permit.

For later-sown crops such as chou moellier and turnips ploughing can still be done. With land ploughed out of grass it is desirable to disc well to assist the turf to rot down in the soil. Ploughed land should be rolled with the furrow to obtain consolidation and to remove air pockets, which affect subsequent crop development. It is most important that every effort should be made to get a thoroughly-good seed-bed.

WHEAT AND OATS

On good land sowings of wheat varieties such as Cross 7, Fife Tuscan, and Tainui may be continued in districts where those varieties have proved suitable.

On light or loose land autumn-sown wheat may require rolling, while on the heavier, compacting soils a harrowing with a penetrating harrow or the drill is desirable to open up the surface. Where it is intended to sow grass and clover in the wheat stand the sowing can be done at this stage. Forward crops of wheat can be given a quick grazing to encourage tillering.

Oats can be sown this month and into October. Good milling varieties are Gartons Abundance, Royal Scot, and Gartons Onward, and varieties suitable for chaff and greenfeed are Algerians, Binder, and Gartons Onward.

BARLEY AND PEAS

Areas of malting barley may be sown this month. Care should be taken to prepare a good seed-bed, and the seed should be drilled evenly to produce a good sample. All varieties of field peas can be sown throughout the month. Partridge and Mammoth Blue are two good varieties that should prove satisfactory on good land.

POTATOES

Seed potatoes require careful watching; if commencing to sprout, tubers should be spread out in the light, preferably under trees, where they will be safe from frosting.

In warmer northern localities where danger from frosts has passed early varieties may be planted. Reliable first- and second-early varieties are Arran Banner, Aucklander Short Top, Arran Pilot, Robin Adair, Epicure, Sebago, Katahdin, and Chippewa. Cultivation for the main crop should proceed as weather permits. Working in the wet should be avoided, as this leads to compacting and the breaking down of the soil into too fine a texture. Potatoes require a crumbly soil, which is achieved best by cultivating in dry weather.

MOLE DRAINAGE

If the surface of the ground is firm enough, mole drainage may be continued in September. Preliminary work in taking levels and digging outlets and open drains should be done beforehand. Make certain that all gear, including tiles for outlets, is on hand and in good order. On wet areas where it is intended to plough, some temporary single mole drains, run through to tap the water, will assist in drying out the fields. Later, when the fields have been levelled and sown in grass, a permanent system can be established.

Mole drainage has played an important part in increasing production on the heavier soils in a few localities, and wider use of the practice would provide for a more general increase in production. Much land that is not actually marshy, but still lies wet into spring, would benefit from mole drainage, and as the main limiting factor to growth on such land is the excess moisture content, which keeps the soil cold, the effects of mole drainage could well be spectacular.

SHEEP FARMS

On sheep farms farmers will be busy with lambing and the subsequent operations of docking lambs and drafting lambs and ewes into age groups. Docking areas should be selected on clean pasture and should not be allowed to become fouled during the work.

Preparation should be made for shearing by cleaning up in the shed and about the yards. As opportunity offers all shearing equipment should be thoroughly overhauled to avoid delays during shearing.

FARMING PRACTICE ON HAWEA FLAT

By P. B. GOW, *Fields Instructor, Alexandra.*

FACTORS rarely encountered in other parts of New Zealand govern farming practice on Hawea Flat, an area of about 10,000 acres south of Lake Hawea in Vincent County, Central Otago. For example the driest month is July and one of the wettest January, while in winter the ground is frozen and the date at which the thaw takes place vitally affects preparations for the new season. The climate of Hawea Flat is particularly suited to the production of cereals, small seeds, and vegetable seeds.

HAWEA FLAT lies between the Hawea River on the west, the Grandview Mountain Range on the east, Lagoon Terrace on the south, and Lake Hawea on the north. Nathaniel Chalmers, the first white man known to have travelled over Hawea Flat, reported that when he saw the country in 1853 tussock was sparse and there were places where small tussock was standing out of the ground with the roots partly exposed. Hawea Flat was surveyed for the Otago Provincial Government by J. T. Thompson in 1859.

The soils of the Hawea Flat are mainly fine and free working and principally of a mica-schist origin. They are underlaid by coarse river-worn gravels.

Climate

During the last 18 years the average rainfall at the Hawea Flat Rainfall Station, which is 1100ft. above sea level, has been 26.4in., with a maximum of 35.5in. and a minimum of 17.74in. In the period the rainfall was above average in 11 years and below average in seven years. The driest month has been July (average 1.83in.) and the wettest January and April (average 2.6in.). Frosts of up to 20 degrees are experienced on Hawea Flat and late frosts occur up to New Year.

Cropping and Seed Production

The main occupation of farmers on Hawea Flat is mixed cropping and small-seed production, with sheep production next in importance. The area produced about 20,000 sacks of grain and grass seed, 500 bales of wool, and 4500 fat lambs and sheep in 1946-47. In recent years the acreage in wheat, oats, and barley has decreased while that in peas has increased. This has been due partly to declining yield and quality of the white crops (resulting from deterioration in the physical condition and the general fertility of the soil) and partly to the fact that the cash return from peas and the soil-building properties of the crop are main factors in its increasing popularity.

Production of Government Certified grass and clover seeds is carried out extensively on Hawea Flat and for the 1946-47 season the areas harvested were as follows:—

	Acres	Sacks (Farmers' dressed seed)
Perennial ryegrass	165	1304
Short-rotation ryegrass	116	1109
White clover	14	38
Montgomery red clover	14	5

Because of the very dry autumn and a lack of bees the clover crops were not a success during 1946-47. Short-rotation ryegrass, grown for the first time, produced very good crops giving a big bulk of sheep feed in winter and early spring and a large tonnage of baled hay after being threshed for seed.

Farmers at Hawea Flat are experimenting with autumn and spring sowings of linseed for the production of high-quality seed and are also using peas and the different clovers, including sweet clover, as soil builders on the lighter land, and are leaving fields in pasture longer than formerly.

Fallowing of land is universally practised on Hawea Flat, mainly to conserve moisture and to clear the ground of weeds. Land which is to be fallowed should be ploughed before the winter to obtain full benefit from frosts, but because of the work involved in connection with autumn sowing of crops, ploughing is usually done in spring. Periodic cultivation is done in spring and summer. Most fallowing is carried out on heavily-cropped land, and areas are left fallow for up to a year. At the end of the period grass is usually sown, but a crop is sometimes put in. By fallowing between the autumn in which a crop is harvested and the following autumn some barley areas have been cropped for many years.

TYPICAL FARM

Typical of the farms of Hawea Flat is the property owned by Mrs. J. Kane, which is situated on the main Hawea Flat-Wanaka road. The farm is of 1316 acres and is divided into 20 paddocks of various sizes. There are 749 acres either in original tussock or which have reverted to tussock after having been broken up for cropping or grass, 194 acres are in grass or pasture, and the balance is in wheat, linseed, oats (for seed and greenfeed), sweet clover, red clover, and swedes (for seed), or either ploughed or fallow.

Stock

The property carries 500 sheep, 6 head of cattle, 2 pigs, and a draught horse. The ewes are Romney cross, which do very well on this country, the flock consisting of 100 two-tooths, 95 four-tooths, and 192 six-tooths and full-mouth sheep. About 120 hoggets are required each year for the replacement of cast ewes. The lambing result is usually 100 per cent. or more and all the surplus lambs are sent away fat off their mothers. The ewes are cast for age at full mouth and are sold as fats either to the freezing works or to butchers, usually to the latter. About 30 wether lambs are kept for mutton.

Romney rams are used for breeding replacements, but Southdowns are used for the production of fat lambs. One Southdown ram is used to 50 ewes and one Romney ram to 30 ewes.

The hoggets shear 12lb. of wool and the ewes 10lb.

The cattle kept are usually dairy cows and the heifer calves are retained for replacements, while steers are sold fat as three-year-olds. Pigs are reared to baconer weight on farm products.

Today the farm has only one draught horse, though until recently an eight-horse team was kept.

Labour

Mrs. Kane's two sons do the bulk of the work on the property, but outside labour is employed for shearing, top-dressing, and harvesting. A rabbiter is engaged at various times of the year to keep the rabbits under control.

The farm carries a full complement of machinery, including a 30 h.p. tractor on rubber, a 3-furrow plough, a 3-ton trailer, a 15-coulter drill, tandem discs, a giant disc harrow, a stiff-tined grubber, tine, chain, and tripod harrows, a Cambridge roller, a 7ft. power mower, a 6ft. binder, an 8ft. header harvester, and an 8ft. binder adapted for windrowing. This implement is an ordinary binder which has been modified to suit special conditions. The top platform, knotting gear, and butting gear have been removed and a tin slide has been put on at a more acute angle than the original platform. The crop comes up the elevating canvases on to the slide and falls to the ground without any interference from the upper gear, allowing the crop to fall evenly into the windrows.

Buildings, which are well constructed and conveniently situated, include two barns which are used for storing fertiliser and seeds arriving on the farm before sowing, and also the threshed grain and grass seed, which are held until they can be forwarded to the rail head at Cromwell some 40 miles away. Where possible seed is sent direct from paddock to rail by motor transport and is stored only if rain delays transport or harvesting.

Lack of Shelter

As on all Hawea Flat farms adequate shelter is lacking on this property. The main shelter is from a belt planted on four sides of the Hawea Domain, which is in the middle of Mrs. Kane's farm. There is also a row of poplars and a row of pines giving slight shelter to one or two paddocks. There are some gorse fences on the property, but these give no shelter from the prevailing weather and the intention is to remove them. More intensive planting of shelter belts on various parts of the farm has been planned.

Rotation of Crops

The usual rotation of crops on Mrs. Kane's farm is grass, peas, wheat, barley, grass, but recently crops of turnips and swedes for seed have partly replaced peas on some areas. Oats are grown only on the lighter ground. Turnips for feed have not been grown for 15 years as, owing to the very dry climate and the damage done by severe attacks of turnip fly and diamond-backed moth, crops were poor. Other

Picking up windrowed barley with a header harvester on Hawea Flat.

TYPICAL HAWEA FLAT FARM

Sheep grazing on Hawea Flat. The area produced 4500 fat lambs and sheep in 1946-47.

crops grow are linseed and sweet clover.

Wheat: For wheat sowings Cross 7 has replaced Jumbuck because of the heavy handling associated with Jumbuck, which is unsuitable for heading. Wheat is usually sown in the autumn at the rate of 85lb. per acre with 1cwt. of reverted superphosphate, but occasionally spring sowing is done, when seeding is increased to 120lb. per acre. Cross 7, which is usually ready for harvesting at the beginning of March, is direct headed. Yields from this variety over seven years have averaged 42 bushels per acre, with a 60-bushel yield in 1943.

Barley: The variety of barley sown is Spratt Archer, which is sown at the rate of 75lb. per acre in the autumn or 100lb. in the spring, with 1cwt. of reverted superphosphate, but where barley is used as a cover crop the seeding rate is reduced to 50lb. per acre. Harvesting commences late in January or early in February, depending on seasonal conditions, the crop being windrowed and later picked up by the header harvester. Yields average 56 bushels per acre, but yields above 80 bushels have been obtained. Usually up to 35 acres of barley are grown on this property each year.

Oats: Oats are usually grown for chaff for winter sheep feed, but in some years part of the crop is harvested for grain. On the light, stony loam oats yield about 2 tons of chaff per acre, while an average yield as grain is 42 bushels per acre, though in a favourable season yields as high as 100 bushels have been obtained on the better class of light land. Gartons is usually grown, autumn sown at the rate of 80lb. per acre with reverted superphosphate. Oats for chaff are cut with the binder and stooked, and for grain either direct headed or windrowed. Oats are also being used as a greenfeed crop, and after being fed off in the winter are allowed to come away again preparatory to being ploughed in as a green-manure crop.

Peas: Peas, which occupy an important place in crop rotations on Hawea Flat, are sown on lea ground in October. Garden peas are grown on Mrs. Kane's farm, but field peas (Partridge) have also been grown. The practice is to drill peas at the rate of 4 bushels to the acre with 1 cwt. of reverted superphosphate. Peas are harvested in March, the power mower being used to cut the crop directly in front of the header. This reduces the loss from wind damage, which can be severe in a windrowed crop. Yields average 36 bushels per acre.

Linseed: When linseed is grown it is generally sown in spring rather than autumn because of the risk of frost damage late in the season. It has been sown only once on Mrs. Kane's farm (in the autumn), when frost did a certain amount of damage. Linseed is drilled at the end of October at the rate of 40 to 45lb. per acre, with 1cwt. of superphosphate, and it is harvested in February. The linseed is windrowed and then picked up with the header.

Crops of turnips for seed production have been grown in recent years, usually drilled in February or March at the rate of 4lb. per acre. Harvesting normally starts between Christmas and New Year, when crops are windrowed with the binder, left for up to three weeks, and then picked up and threshed with the header. Yields vary greatly because of extremes in climatic conditions.

One year radishes were grown for seed as a cash crop, being drilled at the rate of 6lb. per acre. Harvesting was by direct heading, the crop yielding 50lb. of seed per acre. Sweet clover has been tried in recent years and it has grown very well. It is sown at the rate of 6lb. per acre, and has been fed to the sheep in spring and summer. It has been harvested for seed, but now it is being persisted with only as a green-manure crop on cropped-out areas. When harvested for seed sweet clover is windrowed with the binder in late February or early March and left for two to three weeks before being picked up with the header. On the medium to heavy land yields of up to 600lb. per acre are obtained.

Although numerous attempts have been made to grow potatoes, these have usually been unsuccessful because of the severe frosts, which damage the tubers.

Small-seed Production

The farm was one of the first on Hawea Flat on which an area was entered for seed certification. Perennial ryegrass mainly is harvested, but white clover and occasional crops of Montgomery red clover or cowgrass have been grown. All paddocks are sown to grass in the autumn, either in February, which is preferred in a normal season, or in March. A very dry spell will delay sowings until March or even later. Perennial ryegrass is sown at the rate of 15 to 20lb. to the acre with 2 to 3lb. of white clover. Formerly seed was broadcast, but now it is drilled to ensure quicker and better establishment. Ryegrass is shut up for seed at the beginning of November and the harvest starts early in January. The crop is cut and left in windrows for 10 to 14 days before being picked up with the header harvester. Ryegrass yields best in the first year and the second year it is harvested in conjunction with white clover. In the third season white clover only is taken from the paddock. This crop is shut up in the first or second week in November and is usually ready in February, when it is cut with the power mower and later picked up with the header.

Because of the dry conditions which usually prevail during flowering time blind-seed disease of ryegrass is not as serious in Hawea Flat as in other ryegrass seed-production districts.

Red clover, both Montgomery and cowgrass, are sown for seed production. Sowing is at the rate of 6 to 8lb. per acre, with a cover crop of barley. In normal years a hay crop is taken off these clovers before seeding and when this is done paddocks are shut up in October and cut in late November or in December, the second growth producing the seed crop, which is usually harvested early in May. Where crops are being saved for seed only, paddocks are shut up at the beginning of December and harvested in April. Crops are cut with the power mower before being picked up with the header.

Returns from pasture-seed production in this area have been good and high germinations are usual, but seasonal conditions play an important part in the yields obtained.

On Mrs. Kane's farm about 15 acres are saved for hay each year, the red clover pastures, which are harvested in December, being used. In the past all hay has been stacked, but now that balers are available it is intended to bale the hay and so reduce labour. The hay is used as winter sheep feed in the absence of root crops, which are common in most districts of Otago and Southland. About 2 tons of clover hay per acre are obtained in normal years.

Rabbits, which are a serious pest in Central Otago, are kept down by a rabbiter employed part time. The rabbits are usually trapped or ferreted, but poisoning is done occasionally. This property is not seriously infested and the pest has been kept well under control.

Poor Water Supply

The water supply on Mrs. Kane's farm is very poor, the main source being a trust race which supplies water for stock. Though there are several creeks carrying water in winter, these are completely dry in summer when the water is needed most. For household water supply most farmers on Hawea Flat have wells ranging from 46ft. to 110ft. deep and one farmer has a pressure-pump system attached to his well, which supplies water to troughs in the various paddocks. Wells provide a good supply of water and wider use of the pressure-pump system would seem desirable.

Grass for Pasture

When sowing grass for pasture the usual mixture is 15 to 20lb. of perennial ryegrass, 2 to 3lb. of white clover, and 4lb. of red clover to the acre, but cocksfoot, which resists grass-grub attack, is included in mixtures on the lighter land. Pastures usually last from three to five years, depending on whether they have been subject to grass-grub attack or whether, on the heavier ground, they have been used for seed production. One paddock on the property has been in pasture and grazed continually for 60 years.

The farm year on this property commences in July, by which time all cash crops and surplus stock have been disposed of. As heavy frosts usually set in in July, it is essential that the winter ploughing is finished to allow the frosts to break down the furrows. Snow, too, is usual this month. By August, if the frosts break and the ground thaws out, spring cultivation is commenced in order to have the seedbed ready as soon as possible for spring crops.

Apart from the crop programme which has already been described, most of the farm work for the year is concerned with the stock. Lambing starts about September 20 and continues into October, when tailing is done.

In November shearing by machine is carried out. Machine shearing used here is in contrast to the practice common on hill-country runs of many parts of Otago where blades are still preferred because they leave the wool longer, thus affording protection against cold snaps which may be experienced in southern districts about shearing time.

Fly is prevalent about January and lambs are crutched at this time to prevent trouble from that source. The first draft of lambs is taken toward the end of January and sent forward to the works and the final draft is taken off the mothers in February. In the following month sheep are culled and fat sheep sent to the works or to butchers. Dipping is also done in March.

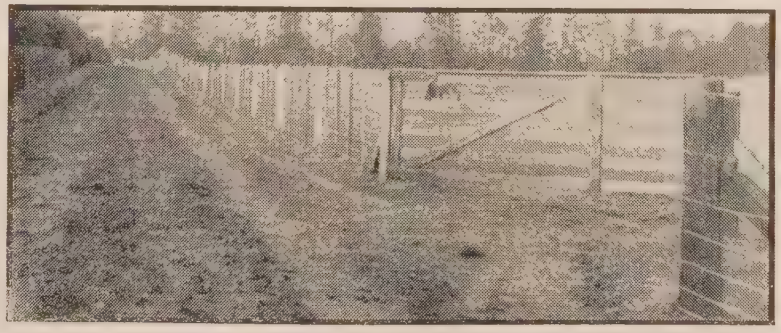
Rams are put out toward the end of April, and crutching of ewes is done at the end of May or early in June.

Because of the climatic conditions existing in Hawea Flat, farm routine in the district follows a pattern quite uncommon in other cropping districts. Whereas the cold winter holds up cultural operations at this time of the year, the hot summer brings crops to maturity very rapidly, and in this way farming practices resemble those of Continental countries in the northern hemisphere rather than those normally adopted in New Zealand.

Acknowledgments

The writer is indebted to Mrs. J. Kane and Mr. D. J. Kane for assistance in preparing this article, and to Messrs. McCarthy Bros. for supplying the rainfall records.

AN EFFICIENT STOCK RACE



The importance of proper facilities for handling dairy stock is often overlooked. A good cattle race is a necessity on most dairy farms and close attention should be paid to its design if the best results are to be obtained.

On the average dairy farm it is necessary to reduce the area of non-productive land to a minimum and any saving effected by the design of the cattle race is important. The average farmer is faced with two major problems in designing a race: First, if he makes the race too narrow he is unable to use it for farm implements and if he makes it just wide enough to take the implements, difficulty will be experienced in negotiating the gateways when the gate is in line with the fence. Secondly, if the farmer makes the race wide enough for farm implements to negotiate the gateways satisfactorily, he wastes productive land.

The illustration above shows a very effective stock race which combines compactness with efficient working. By setting off the gateways it is possible to take farm implements in and out of the paddocks without difficulty. A further advantage of this design is that pugging of gateways is greatly reduced. There are no difficulties associated with the construction of the race, the only addition to the standard race being the angle post, which requires a stay.

—*A. J. PRICE, Fields Instructor, Hamilton.*

THE HOME GARDEN IN SEPTEMBER

By A. G. KENNELLY,
Instructor in Vegetable Culture, Christchurch.

THE most important garden work in September is seed sowing, because in normal seasons the ground even in the colder districts has warmed sufficiently to enable the seed of all hardy plants to grow satisfactorily; in a few of the more favourably situated districts even frost-tender subjects such as dwarf and French beans, pumpkin, cucumber, and marrow may be sown. Under glass, tomatoes, celery, and cape gooseberries can be sown, and according to conditions leeks, brussels sprouts, and cauliflower can be sown either under glass or outdoors.

PREPARATION of the ground such as digging in green crops and forking or digging over soil for sowing or planting should be continued during September, and a balanced fertiliser containing nitrogen, phosphoric acid, and potash can be applied.

Early potatoes will need protection from frost, and seedling lettuce, silver beet, cauliflower, and cabbage can be set out, or gaps filled in previously-planted crops. In exposed situations broad beans can, if required, be supported by strings tied at suitable heights to stout stakes placed at 5 or 6ft. intervals.

Established crops such as silver beet, cabbage, and cauliflower can be stimulated into more vigorous growth where soil drainage and temperatures are favourable by a weekly application of liquid manure made by soaking a small bag of animal manure in a large container of water until the liquid is the colour of weak tea. In southern districts particularly, September is a good time to plant asparagus; the soil should be moist and well drained and the seedlings neither too far advanced in growth nor kept too long out of the ground. Globe, Chinese, and Jerusalem artichokes can still be set out or the seed sown, and onions set out as advised in last month's "Journal." Pea seedlings should be protected from birds and successional sowings made at suitable intervals.

[Green and Hahn Ltd. photo.

Liquid manure, which is made by soaking a bag of animal manure in a container of water until the liquid is the colour of weak tea, will stimulate established crops such as silver beet, cabbage, and cauliflower.

[Green and Hahn Ltd. photo.

In seed sowing attention should be given to such points as not sowing when the ground is too wet, forking it over lightly if rain has fallen since it was dug, sowing seed thinly, and sowing at the correct depth. When the seed drill is filled in it can be gently firmed by tamping it with the back of the hoe.

Seed Sowing

Though preparation of the seed-bed and the sowing of seed are comparatively-simple operations, the principles governing them are often little understood and the work itself imperfectly carried out. The following points should be borne in mind:—

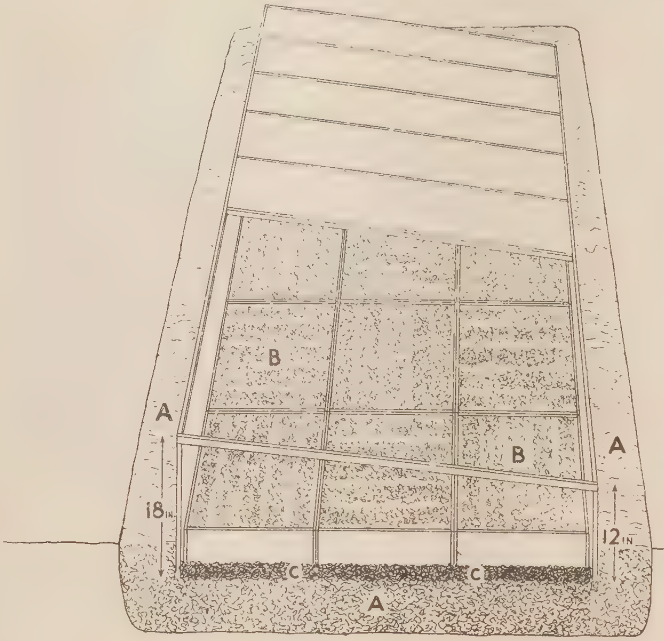
1. If the soil sticks to the boots when walked on, it is not advisable to sow.
2. Ground ready for sowing should be lightly forked over if a considerable amount of rain has fallen since it was dug, after which it should be lightly refirmed by shuffling across it to eliminate air pockets and the surface then raked fine. Lumpy soil should be broken with the rake and all stones and other foreign matter removed.
3. Seed should be sown thinly, as germination of most seed sold by reputable seedsmen is good, and thick sowing inevitably means waste of seed and of time required in thinning.
4. Seed depth is very important, particularly with fine seed, and in most cases the depth recommended on the seed packets should be followed closely. However, in some cases a little latitude is permissible; for instance, in sandy or fine, dry soil or in summer, when the soil is warm, seed can be sown a little deeper, and in heavy soil which is inclined to retain its moisture or where the ground is cold sowing should be a little shallower.

Hotbeds

Except in districts which experience a very mild winter and are relatively frost-free, the keen home gardener often finds it desirable to have a hotbed or cold frame by which plants can be given a longer season of growth and consequently come to fruition more quickly. A frame with a glass sash on top is very useful, but unless it has a very good exposure to the sun or the weather is good, results are often disappointing, because temperatures cannot be maintained consistently high enough for growth. Some form of heating is usually necessary. In a few home gardens horse manure is available and a properly-made heap of it can be used.

The preparation of manure for a hotbed is not as simple as might be supposed; any manure or stack bottom is not necessarily suitable. To be certain that it will heat, the material must have the correct moisture content and must not be too old. Heating is brought about by fermentation

FRAME ON HOTBED FOR RAISING SEEDLINGS



The frame can be simply placed on a squared, levelled heap of fermenting manure which has been properly prepared, or the heating medium can be a low-tension electric current. The excavation is not essential, though it helps to conserve heat. A—Fermenting manure. B—Seed boxes (end of frame removed). C—Layer of soil.

as the result of microbial activity, and as the environmental factors, together with that state of the material which induces microbial activity, are sometimes difficult to secure and control, the making of hotbeds with material other than horse manure is rarely undertaken. Fresh horse manure that is not mixed with too much straw and is not too wet or too dry heats up quickly and holds its heat well. The fresh manure should be turned twice or three times and a sufficient interval allowed between turnings to enable the heap to heat so that finally the manure is in a uniform state of fermentation.

The best type of manure has a fairly-high natural moisture content and not too much straw and heats rapidly to a very high temperature. A sprinkling of leaves incorporated in the heap will steady the heat, and after it has been forked into position and gently firmed it should be left for a few days until the temperature drops below 90 degrees F. and becomes steady. A good temperature for seedlings is about 65 degrees F., but attention must be given to ventilation.

A method of soil warming which could be very useful in the home garden for raising seedlings is the use of low-tension electric current. This method was developed extensively overseas during the war for propagating and was used experimentally for the production of early food crops. The cost of the equipment is comparatively low and, perhaps more important at present, the amount of power used by a small unit is extremely small. Owing to the low voltage used there is no danger to the operator.

The method is being used in New Zealand principally for propagating in frames, and the cool storage officer of the Department of Agriculture, Wellington, has carried out a number of tests and can give detailed information to those interested. A transformer is necessary for the reduction of the voltage from 230 to 12 volts and the heat is applied through a galvanised-iron-wire circuit, which is usually placed about 6in. deep in the soil. A soil thermostat is installed through the side of the frame about 2in. above the level of the wire, and the soil is thus maintained at the desired temperature, which is about 60 to 65 degrees F. for propagating. The area of the soil to be warmed will determine the capacity of the transformer required and the gauge and length of the galvanised-wire circuit. When the warming is thermostatically controlled about 7 watts to 1 sq. ft. of soil is sufficient.

Autumn and Winter Vegetables

Early sowings of brussels sprouts, broccoli (winter cauliflower), and savoy cabbage can be made at the end of the month. Brussels sprouts are a delicious vegetable with a well-deserved popularity, and successional crops can be grown in most districts so that they are available from early autumn until August. Broccoli can be harvested throughout late autumn, winter, and the greater part of spring, and in districts that experience a very mild winter cauliflower may be grown and harvested in the same period. The season for savoy cabbage is similar to that for brussels sprouts, but because tender and quick-maturing varieties of cabbage can be grown easily during the warmer parts of the year, savoy cabbage is usually grown for cutting in late autumn and winter. Varieties of savoy cabbage and broccoli or winter cauliflower should be chosen and sown with special care so that they mature when required. It is important that they make most of their growth before winter, but for late varieties it is not desirable for growth to be too far advanced.

Seed should be sown ½in. deep in rows 1ft. apart. The seed-bed should be rich in humus and well worked and the surface of a fine tilth. The young plants should be ready under average conditions for setting out in six to eight weeks. Any good seedsman's catalogue will give a list from which suitable varieties can be chosen. Alternatively, plants for setting in the field can be purchased in most districts in December and January.

Beet

Successional sowings of red beet or a first sowing can now be made where soil conditions are favourable. After an early sowing of the turnip-rooted or globe variety it is a good plan to sow an intermediate or long variety for the main crop. Beet does well in ground that was heavily manured for a previous crop. Seed should be sown ½in. deep in rows 12in. apart and the plants later thinned to about 4in. apart. Good varieties are:—

Globe and turnip-rooted: Derwent Globe, Egyptian Turnip-rooted.

Long and half-long: Long Red, Obelisk.

Broad Beans

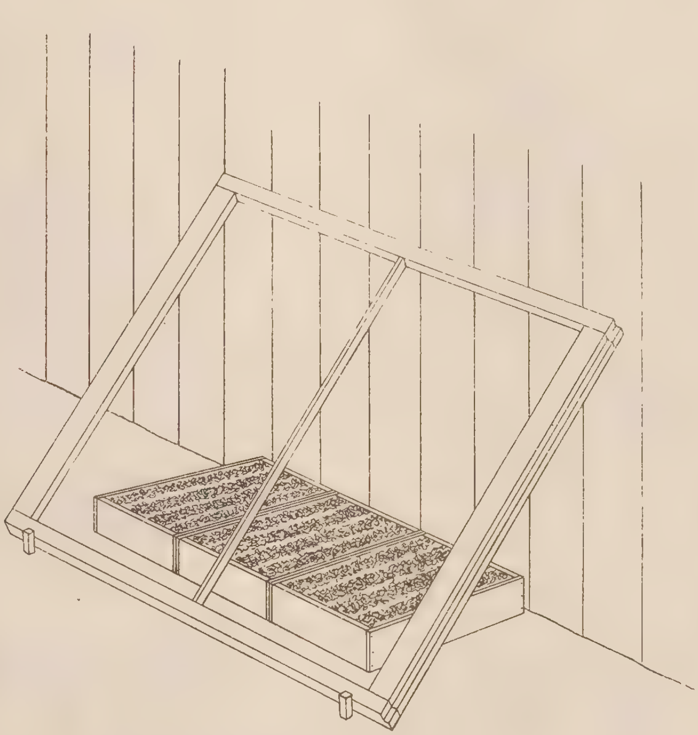
Though broad beans are primarily a cool-weather vegetable, they can still be sown in most districts, but sowing is not advisable on soils that tend to dry out. The plant prefers a fairly heavy, well-drained soil that is not lacking in lime, and seed should be sown as advised in last month's "Journal." Dwarf varieties deserve to be grown more widely in New Zealand home gardens, and a variety such as Coles Dwarf, which grows only about 2ft. high, is excellent. Other good large varieties are Broad Windsor and Early Longpod.

Cardoon *(Cynara cardunculus)*

When it is grown in the vegetable garden the cardoon bears some resemblance to celery, though it is considerably larger and reaches a height of about 4ft. If grown and allowed to flower as an ornamental, it resembles more the globe artichoke, to which it is nearly related. It is rarely seen in New Zealand gardens and in the vegetable garden is grown for its blanched growth, which is used in soups and stews and to some extent for salads. The soil in which it is grown should not be allowed to dry out and where conditions are likely to become dry it is best grown in trenches after the manner of celery. Soil should be rich in plant food such as well-rotted farmyard or stable manure.

Seed can be sown in permanent positions in October in rows 3ft. apart in small groups 18in. apart, and later thinned so that only the strongest plant is left in each group; each should be staked and when full growth has been attained (usually in February) the leaves gathered together, wrapped with paper, and earthed up. Blanching takes about eight to nine weeks. Only the inner leaves are used in salads.

SHELTER FOR SEED BOXES



Where frosts are not severe a temporary shelter for seed boxes can be provided by propping a sash against a sunny fence.

Carrots

If carrot seed has not yet been sown, a sowing should be made as soon as soil conditions are favourable. In most districts the main crop can be sown, though there is no urgency where supplies are assured from earlier sowings. In Auckland, where the carrot rust fly (*Psila rosae*) is troublesome, serious infestation can usually be minimised by sowing the seed of the main crop in October or early November, when the first generation has passed its peak and before peak development has been reached (usually about Christmas) by the second generation.

In gardens previously subject to attack it is most important to sow as far as possible from where such susceptible crops as celery, parsnip, carrots, or parsley have been grown, as the rust fly overwinters in the soil in pupal or maggot form. The adult is a small, shining, black fly about 1/16 to 1/18in. long with transparent wings and yellow legs. Control is difficult, but horticultural naphthalene broadcast at the rate of 4oz. to 20ft. of row at 10- to 14-day intervals will serve as a deterrent; its use should be discontinued about a fortnight before harvesting, or the vegetables may have a flavour of naphthalene after cooking.

The carrot rust fly, which in its larval state burrows through the roots and may cause young plants to wilt and die, has not yet been recorded in the South Island. It should not be confused with the carrot aphis (*Cavariella aegopodii*), which commonly attacks carrot foliage in all parts of New Zealand. The aphis or "greenfly" is a green or light-yellowish-green insect either wingless or with four transparent wings. Young and adult forms are similar except in size, the largest usually being smaller than a pinhead.

Though in warm districts the aphis can overwinter in its normal form if suitable host plants are available, in the colder districts overwintering eggs are laid around the buds of willows. They hatch out in spring and may then migrate to carrots. The aphis is easily controlled on carrots by regular spraying with nicotine sulphate 1 : 800 (1 fl. oz. of nicotine sulphate to 4 gallons of water plus 2oz. soap). It should be applied if possible on a hot, still day and complete coverage given. Late-sown carrots sometimes escape aphis attack and for this reason the sowing of the main crop is sometimes deferred until late December or January.

Like most fleshy, tap-rooted crops, carrots do well in a soil that received a liberal dressing of organic material such as stable or farmyard manure for the previous crop. Commercially the best crops are usually produced on deep, sandy or light loams well supplied with organic matter. Though carrots are fairly tolerant of acid conditions, where a deficiency of lime is suspected it can be remedied on most soils by the application of 2 to 3oz. of lime a square yard. If the soil contains sufficient organic matter, or its deficiency in plant food has been remedied by the application of a balanced fertiliser early in the season, additional artificial manure should not be required.

Popular varieties of carrot for main crop are Chantenay, Manchester Table, and James Intermediate.

Cauliflower and Cabbage

Seedlings of cauliflower and cabbage sown earlier in frames should now be hardened off. Where downy mildew shows signs of developing, a home-mixed Bordeaux spray (bluestone, hydrated lime, and water) should be applied and repeated in about seven days. Early September is a good time to make a successional sowing in the open. A succession can be arranged by sowing similar varieties and allowing regular intervals between the dates of sowing or by sowing varieties with different maturity periods at about the same time. Varieties of cabbage such as Golden Acre, Copenhagen, Market, and Henderson's Succession, which, if planted about the same time, will mature successionally, or cauliflower such as Early London or All Seasons, Phenomenal Early, Phenomenal (5 months), and Phenomenal Main Crop are good examples of the succession that can be obtained.

The seed-bed for cabbage and cauliflower should be well drained and broken down to a very fine tilth. Seed should be sown thinly $\frac{1}{4}$ to $\frac{1}{2}$in. deep in rows, as the seedlings are easier to weed and cultivate and are usually sturdier and easier to lift than if the seed is broadcast. The ground where the plants are to be set out should be well drained, deeply cultivated, and enriched with well-rotted farmyard or stable manure or compost. It is necessary to differentiate between the manuring of the seed-bed and the land on which the crop is to mature. The latter can with benefit be greatly enriched with manure, but as germinating seed is liable to rot if it comes in contact with a considerable quantity of manure, the seed-bed should receive only enough manure (and that well incorporated) to give the seedlings a good start.

Celery

Except in favourable situations in the warmer parts of New Zealand, celery should be sown under glass, as it is very important that the temperature should not fall during its growing season. Few home gardeners have the facilities to grow plants from seed and therefore most buy plants usually in December or January for setting out. Loss of celery because of premature seed development is common in home

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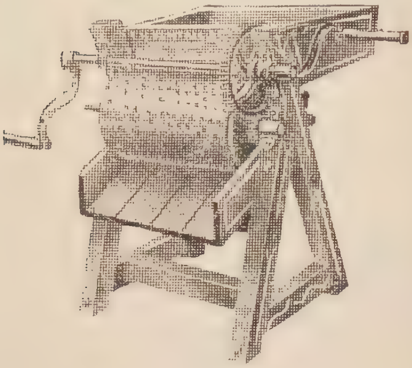

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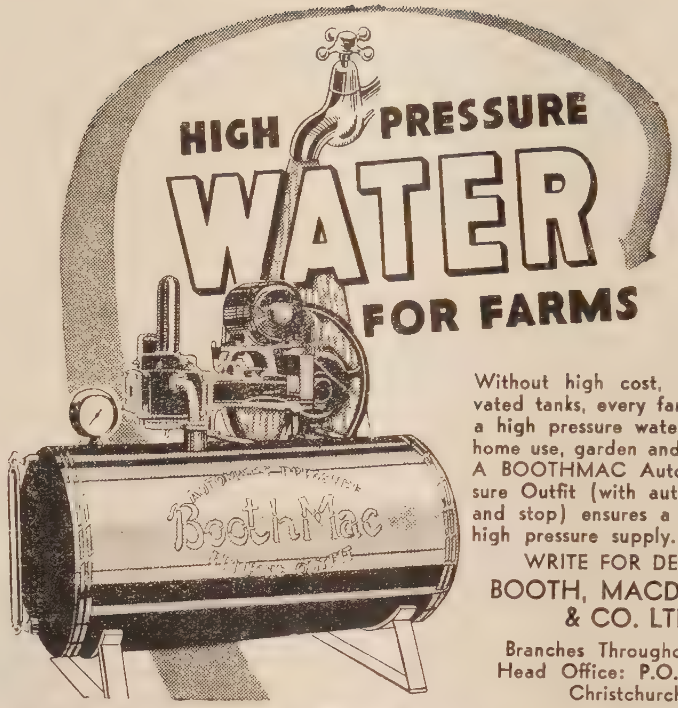

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gardens and this is primarily caused by the plants being subjected to low temperatures during the growing period.

Experiments have shown that in every case where plants are subjected to temperatures below 50 degrees F. for a period of two weeks or more there is likely to be a high percentage of seeders. Growing plants should therefore be kept at temperatures considerably higher than 50 degrees F., and 65 to 70 degrees seems desirable. The tendency to "bolt," caused by exposure to two weeks or more of low temperatures can, however, usually be corrected, provided the seed shoot has not started to develop, by a corresponding period of high temperatures immediately following the low. Even in plants subjected to low temperature in the field the tendency to "bolt" can be corrected (if seed development has not started) by a similar period of high temperatures.

Celery seed should be sown in a fine, moderately-rich, specially-prepared soil and when the seedlings are large enough to handle they should be pricked out about 2¼ to 2½in. each way in the boxes from which they will ultimately be planted in the field. Plenty of ventilation is desirable and the seedlings should be kept near the glass so that they do not become drawn up.

Self-blanching varieties are most popular and those commonly grown are Golden Self Blanching (of which there are two strains, the dwarf, which is most popular, and the newer tall strain, which is slightly earlier) and Golden Plume, which is somewhat similar but earlier. A number of home gardeners still favour the older type of celery which requires to be earthed up or wrapped. Crystal or Solid White is a good representative of this type and is used a good deal in southern districts.

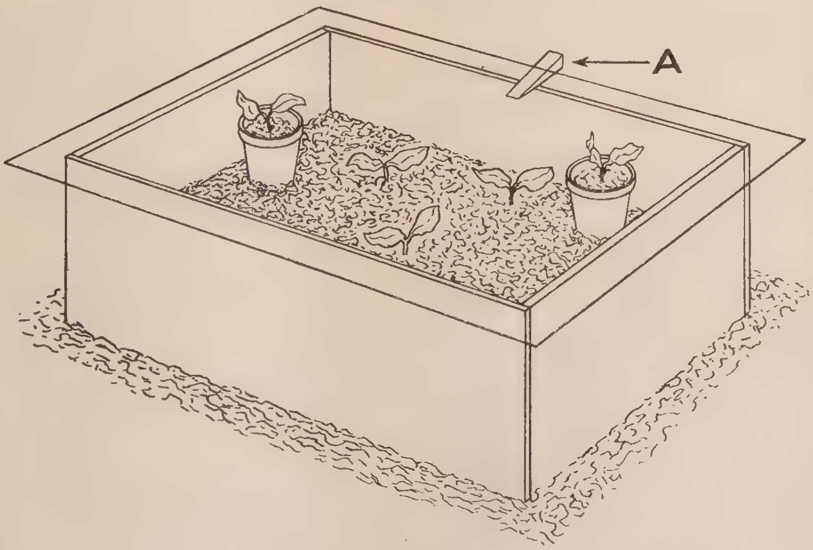
[Green and Hahn Ltd. photo.

Strong celery plants which have been pricked out in a box and which are ready for planting out.

Frost-tender Vegetables

Except in a few favourable situations in the warmer districts, tender plants such as pumpkin, marrow, cucumber, and capsicum should at this time of year be sown in either a glasshouse or a heated or well-situated frame or sheltered hotbed. Times of sowing and planting out vary according to district as described in last month's "Journal."

IMPROVISED FRAME



A simple method of giving an early start to such subjects as cucumber, marrow, and melon is to place a box with the bottom knocked out and covered with a sheet of glass over a small quantity of fermenting manure which has 2 or 3in. of soil on top of it. The seed should be sown in the soil or in pots, but it is advisable to place the box in a sunny, sheltered situation, to give ventilation as shown at A if an appreciable amount of moisture condenses on the under surface of the glass, and where frosts are severe to cover with sacking at night and block all air holes.

Leeks

December or January is the preferred time to set out leeks. Plants are usually bought from a seedsman, though they are easily raised from seed. A sowing can now be made in a warm position in well-drained soil that has been deeply cultivated and worked to a fine tilth. Leeks are a great standby and can be grown so that they are available as a fresh vegetable for probably a longer period and over a greater part of the country than any other vegetable. They suffer little from insect pests or diseases and are a good source of vitamins B and C. They are very accommodating, but respond well to liberal manuring and good cultivation.

The main types of leek grown in New Zealand are:—

1. **Musselburgh:** This is very hardy and under good conditions is characterised by its long, thick stem.

2. **London or Broad Flag:** Though not as hardy as the Musselburgh, this leek seems to be hardy practically anywhere in New Zealand. The stems are not quite as long as those of the Musselburgh, but it is earlier and has large, soft, drooping leaves.

3. **Lyon:** A more variable type of leek, Lyon is generally similar to the London Flag, but it grows larger and is slower in maturing. It is especially suitable for a late crop, as it is slow in running to seed.

Leek seed should be sown thinly ½in. deep in rows 12in. apart. Half an ounce of seed is sufficient for about 100ft. of row.

THE HOME GARDEN IN SEPTEMBER . . .

Mustard and Cress

Mustard and one or other of the different kinds of cress deserve to be more widely grown in New Zealand by home gardeners who appreciate good salad. Mustard is used in the seed-leaf stage; white mustard should be chosen, as the brown is usually rather bitter. Frequent sowings must be made, and though seed may be sown on an open border during most of the growing season, a shady situation is necessary where conditions become hot and dry. Black rape is sometimes grown instead of mustard, as its culture is easier, but mustard has a superior flavour.

Like mustard, cress (*Lepidium sativum*) should be sown frequently, and somewhat thickly, but not too much so. Either the curled- or plain-leaf type of cress can be used, as the plant is cut in the seed-leaf stage when about 2in. high and when short, plump, green, and tender. Cress is a little slower in growth than mustard, and though both can be sown on the open border, for best results a pot or box filled with material such as bulb fibre should be used, as plants grown from seed sown in soil are often gritty. If soil is used, the seed is best simply pressed firmly on it with a block of wood. After sowing, the box should be thoroughly watered and then covered (an inverted box is excellent for the purpose) and in a few days growth should be sufficient for it to be brought into the light so that the leaves and to some extent the stems turn green. If the boxes of soil require watering, they are best plunged in a large container so that the water soaks up through the bottom; if watered with a can, the soil usually splashes on to the stems and is often difficult to remove when preparing the plants for the table. Cutting can be done with scissors.

Water Cress (*Nasturtium officinale*). Few home gardeners realise that a running stream or a pool is not essential for the cultivation of water cress. A shady spot should be chosen and deeply trenched and enriched with moisture-retaining material such as rich, old leaf mould or compost. If sowings are made in September or October and again in February or March, ample water is given, and in the colder districts the beds are protected by a frame in winter, cress can be harvested throughout the year. The water supply in dry weather must be liberal, or the quality of the cress will be poor. Weeds should be removed when small, as the bed will be spoilt quickly if they are allowed to become established. Water cress can also be cultivated successfully in large pots stood in saucers of water if the pots are kept in reasonable shade.

American or Land Cress (*Barbarea praecox*) is not unlike water cress in appearance, though the flavour is usually slightly more pungent; like water cress, it requires a moist situation and should be kept well supplied with water. In the warmer districts it is best grown as a spring or autumn crop, as it does not thrive during the heat of summer. Once the plant is established the leaves and stems can be gathered, or if the growing point is pinched out, leaves can be harvested as they develop. Under favourable conditions the foliage is ready for harvesting four to six weeks after sowing.

Onions

In most South Island districts main-crop onions are sown in September if ground conditions are favourable. The seed-bed should be well drained and worked to a fine tilth. It should be firm without being too consolidated and should have been enriched with organic manure some time previously. Plantings should not be made in heavy, clay soils; the ideal soil is a fertile, well-drained, moderately-light loam of good depth, and where drainage is faulty a drainage system must be installed. Soil that has been under cultivation for several years is preferable to new land, but it should be weed-free, especially for seed sowing.

Though varieties and cultural practices have an important bearing on production, fairly-heavy soils usually produce a good-keeping but relatively-slow-maturing onion, and sandy soils usually produce a thinner-skinned, quick-maturing onion that is generally of poorer-keeping quality. Onions can be grown on soils that are reasonably fertile without applying organic manure if the water-table is high and if the composition and placement of the fertiliser are suitable. The plant food should be readily available, but in such a form and in such quantities that it does not cause burning or, paradoxically, starvation. Onion roots arise from the stem plate at the base of the fleshy part of the plant. They are fine, but very numerous, radiating in all directions and forming a fibrous tuft. On most soils the roots do not exceed 10 to 12in., though in a few instances they reach 20in.; they do not arise as normal plant roots, but continue to develop from the stem plate as long as the plant is growing. The main root zone is usually within 6in. of the bulb.

Because it is grown for its vegetative qualities, the onion requires a slowly-available source of nitrogen, and on most soils crops will benefit from a heavy dressing of stable or farmyard manure applied in the autumn and to which has been added to balance its nitrogen and potash content about one-thirtieth of its weight of superphosphate. It is not advisable to apply the manure in spring, as the bulbs may be stimulated into excessive leaf growth and weed seed is liable to be troublesome. Few home gardeners are likely to have the stable or farmyard manure required, but should apply available well-rotted organic material such as compost plus artificial manure. Because of the great variation in soils and their condition throughout New Zealand, only local experience and knowledge can indicate fertiliser requirements, but if soil conditions and fertiliser placement are correct, it seems difficult (judging by experiments that have been carried out) to over-fertilise the onion.

The onion is very sensitive to excessive soil acidity, and if the soil has not recently been dressed with lime, at least 2 to 3oz. of carbonate of lime should be applied to the square yard.

Varieties: Pukekohe and Turbot are good-keeping varieties, but for more immediate use there are plenty of other good, high-yielding varieties such as Ailsa Craig, Giant Rocca, and Brown Globe.

Orache (Mountain Spinach)

Though it is rarely seen in New Zealand gardens, orache is a useful and interesting plant. The older leaves are a good substitute for spinach. Orache is an ornamental plant and grows to a height of from 4 to 5ft. There are white, red, and green varieties, but usually the white is preferred for culinary use. The young leaves can be used in salads.

Seed should be sown in September or October, when the ground is sufficiently warm, and the plants spaced 2ft. apart each way in a good, rich

[*Green and Hahn Ltd. photo.*

Onions require a slowly-available source of nitrogen, but manure should not be applied to the soil in spring, as the bulbs may be stimulated into excessive leaf growth.

[Green and Hahn Ltd. photo.

Peas can be protected against birds by wire-netting guards, the ends of which must be blocked.

soil. Half a dozen plants are ample for most families. The plants should be staked if in exposed situations.

Parsnips

A small early sowing of parsnips may now be made. A moderately-rich soil containing well-rotted organic manure which was applied to a previous crop is best. The turnip-rooted or oxheart varieties are especially suitable for early crops.

Because of its rather sweet flavour, which is not altogether in accord with modern tastes, the parsnip is usually relegated to winter use, and in most southern districts the main crop is sown in October; in northern districts November and December sowings are preferred. The soil should be deeply dug; trenching is advisable on most soils if long roots are desired. The seed should be sown ¼ to ½in. deep in rows 15in. apart and the plants thinned 4 to 8in. apart as soon as they are established. Where large roots are desired spacing should be liberal, and to save thinning, four or five seeds can be sown together in a group and only the strongest left. The reason for this seemingly-wasteful rate of sowing is that parsnip seed has a very low germinating capacity (even that of one-year seed is only about 65 per cent.).

A few radish or even lettuce seed sown between each group of parsnip seed should germinate quickly and will not only serve to mark the position of the rows, but will provide a quick-maturing crop that may be harvested before the parsnips require the intervening space. For main crop a good strain of the Hollow Crown variety is best where soil is deep, but for the shallower soils The Student will be found satisfactory.

Peas

Few vegetables are more popular or as rich in vitamins as garden peas. Green peas are a rich source of vitamin A, B_1, B_2, and C, and though they are not heavy yielding in comparison with crops such as carrots or cabbage, they deserve to be grown by all home gardeners who have sufficient space. Cool but not cold conditions and a moist, deeply-cultivated, well-drained soil containing plenty of humus are best. For a good crop soil preparation should be thorough. The soil should be deeply dug, and well-rotted organic material such as compost or farmyard manure incorporated some time before sowing. The addition of superphosphate at the rate of up to 2oz. a square yard has been found beneficial on many soils; seed (which for the early sowings should be dressed with a suitable seed protectant as advised in last month's "Journal") should be sown in V-shaped or broad, flat drills drawn out with the hoe. Drills should be 2 to 3in. deep, but where ground conditions are warm they can be considerably deeper so that, though the seed should not be covered with more than 1 or 2in. of soil, the roots will be well down in the cool, moist soil if the weather is dry or the wind boisterous and the plants can be earthed up from time to time as they establish themselves. Seed should not be thrown carelessly into the drills or sown in wet soil, but should be placed in the drills 2 to 3in. apart each way. The rows should be spaced 18 to 36in. apart according to the height of the variety.

Black cotton stretched along the line of the row or guards made of wire-netting will protect the newly-emerged plants from birds, but if wire guards are used the ends must be blocked.

Practically all reputable seedsmen's catalogues give a list of good varieties with heights and the approximate number of days each variety requires to mature. W. F. Massey and Greenfeast are the most popular varieties, but the sugar or edible-podded kinds deserve a place in gardens having the space. There are several varieties and their culture is the same as that of ordinary peas. The pods can either be picked when young, topped and tailed, and eaten like French beans, or the older pods shelled, the peas eaten, and the pods used in soups.

Potatoes

In districts free from late frost potatoes may now be planted, but in most South Island districts it is not yet safe to make a general planting. It is advisable to plant Government Certified seed, as the yield from it is on the average consistently higher than that from uncertified. The soil should preferably be deeply and thoroughly cultivated, as thorough preparation of the soil not only ensures a perfect seed-bed, but helps to maintain satisfactory moisture, aeration, and temperature. Soils that have been trenched should, however, be given time to settle before planting commences.

Because they may induce a condition which favours scab, heavy dressings of organic manure are not advisable just before planting; a heavy dressing applied the previous year so that it is thoroughly decomposed or a green crop dug in some time before planting will, however, usually give satisfactory results, as also will the addition of such material as grass clippings. Soils which have been heavily limed should not be used; the potato is tolerant of acid conditions, and in soils infected with the potato scab organism the growth of the organism will be suppressed if the pH value of the soil (that is, its state of acidity or alkalinity) is medium to strongly acid. Apart from soil acidity, the development of potato scab is influenced by both soil temperature and moisture. Its development is usually favoured by conditions where soil moisture is slightly below the optimum requirement for growth. Reduction in yield of up to 10 per cent. because of scab is not uncommon, but because this disease, unlike late blight (*Phytophthora infestans*), does not show up spectacularly, often little notice is taken of it and sometimes infected tubers are planted in clean soil.

The fertiliser required for potatoes depends largely on the amount of organic material previously incorporated in the soil, but in general it has been found in Department of Agriculture trials that a mixture of 3 parts of superphosphate and 1 part of sulphate of ammonia gives satisfactory results. Where this is not available equal parts of superphosphate and blood and bone can be used.

The simplest way to plant is usually to open a trench about 4in. deep and to dust the fertiliser along it at the rate of about 1 to 1½oz. a yard. Tubers can be set in rows 2ft. apart and 10 to 16in. apart in the rows. Close planting is usually advisable for early

[Sparrow Industrial Pictures Ltd. photo.

Potatoes 4oz. or more can be cut into two or more sets for planting, but each set should have at least two eyes and a minimum of cut surface.

crops. If the tubers are large (that is, 4oz. or more), they can be cut into two or more sets if desired. Each should have at least two eyes and a minimum of cut surface. Cut tubers should be planted immediately. The soil should not be too wet or too dry. If the cut surface is permitted to dry out before the protective skin is formed, the plants are likely to be poor. Numerous trials have shown that seed planted almost immediately it is cut gives a higher yield than if the cut surface is allowed to dry out. Dusting the cut surface with ashes, sulphur, or lime to dry it is not necessary, though sulphur may have some value because of its fungicidal action.

Potato tubers do not need to be sprouted, but sprouting is of value, as it gives earlier growth and with early varieties earlier lifting; with main crop varieties, too, the crop obtains a better start and in most seasons matures earlier. Short, sturdy shoots should be aimed at, as long, weak shoots are easily knocked off or damaged in planting.

In the principal potato-growing districts the planting of the main crop is not commenced until October, which in general will be found a suitable time.

Varieties

Though it is advisable to choose varieties that have proved suitable for local conditions, the following are widely popular:—

Epicure: A good first-early, this is popular with home gardeners.

Arran Banner: This is not a true early variety, but can be dug almost as soon as Epicure; if left, it usually yields a heavier crop. It should not be used for keeping, as its quality falls off.

Doon Early: This has proved to be a good first-early and is extensively grown in home gardens.

Diseases

Apart from potato scab disease, which is often seen in one or other of its forms—powdery scab and common scab—the symptoms of either of which (scabby spots which may vary in appearance from roughened, shallow depressions to corky protrusions) do not generally differ to the naked eye, the disease rhizoctonia scurf or black scurf (*Corticium solani*) should be carefully guarded against. Tubers should be examined before planting for the presence of brown-black bodies varying in size from a pinpoint to more than ¼in. across; they are the resting stage or sclerotia of the fungus and may be easily levered off with the fingernail. If infected tubers are planted and conditions favour it, the fungus sends out fungal threads which attack new tubers, stolons, and, particularly, the tips of the sprouts. Should temperatures be comparatively low, successive shoots may be killed as they develop, and though new shoots may arise and succeed in establishing themselves as the season advances and soil is warmer, emergence above ground will be delayed. Frequently all the shoots are killed, resulting in failures of tubers in the row. Infection may also take place late or develop later when conditions favour it. Results of attack may range from a rolling or rosetting of the leaves or, late in the season, a yellowing of the young leaves to the production of aerial tubers or the development underground of many small tubers or just a few knobby ones.

Important points in the control of this disease are the planting of clean seed, adequate manuring to stimulate growth, early rotation, and soil warmth.

Unsprouted seed potatoes slightly infected with common scab or with black scurf can be disinfected with corrosive sublimate (bichloride of mercury) if they are to be planted in clean ground, but in view of the relatively-small amount of seed required by most home gardeners and the poisonous nature of corrosive sublimate it is usually advisable to obtain fresh seed. Should it be found necessary, however, the tubers can be treated as follows (wooden, earthenware, concrete, or enamel containers should be used): Dissolve 1oz. of bichloride of mercury or mercuric chloride in 1 quart of hot water. When dissolved add it to 6¼ imperial gallons (1 : 1000) of cold water, immerse the uncut tubers in the solution for 1½ to 2 hours, remove the potatoes, and allow them to drain and dry. Potatoes are best wet for 20 to 24 hours before treatment to facilitate the removal of dirt and to help soften the sclerotia or scurf. The strength of the solution decreases with use, but the amount recommended above is enough to treat from 40 to 50lb. of potatoes. This should be ample for the largest home garden, but if more are to be treated, mercuric chloride should be added at the rate of ½oz. to each additional bushel of potatoes treated for two hours, together with water to bring the solution to its original proportions.

This chemical is a deadly poison and its use is not advised in the home garden unless clean seed of a suitable variety is unobtainable.

Rhubarb

If it is intended to plant a new bed or split up and replant old rhubarb crowns, the work should be done immediately. Rhubarb will stand considerable neglect, but the more correct and liberal the treatment the better the response will be. Results from shifting or planting crowns now are therefore likely to be more satisfactory in southern districts or where main-crop varieties are used, because growth will not be so far advanced. Soil should be deeply dug and richly manured with material such as compost or farmyard manure; heavy dressings of blood and bone have also given good results.

Though it is usual to establish new rhubarb beds by splitting up and replanting old crowns or by buying crowns, rhubarb can easily be grown from seed sown in spring 1in. deep in rows 15in. apart in any fertile, well-drained soil. The seedlings should be thinned to about 6in. apart as soon as they are established. The young plants can be set out in their permanent positions early the following spring. Unless the plants are growing very strongly, few if any stalks should be pulled until the second year after establishment. The ground for the new bed should be rich in humus and well drained and should not be overshadowed by trees.

Where rhubarb is forced by covering the crowns with boxes or straw care should be taken to replace the covering each time stalks are pulled, because, though ordinary rhubarb is hardy enough to stand the average run of spring frosts, forced rhubarb is liable to severe damage if suddenly exposed.

Salad Vegetables

Lettuce, turnips, radish, and spring onions should be grown quickly, or they are likely to be tough and stringy and in some cases flavourless or bitter. None of these crops lasts in the best condition for long, and successive sowings should be arranged so that a new crop is approaching maturity as the old passes its best: small sowings are therefore preferable. Well-drained soils that have been deeply cultivated and worked to a good tilth are suitable, provided they contain plenty of humus, as it is essential that they do not become too consolidated, yet in dry weather they should have good moisture-holding capacity. Seed should be sown ¼in. deep in rows 12in. apart. Lettuce should be thinned or set out 8in. apart in the rows, and turnips thinned 3 to 4in. apart. If sown thinly in free. well-worked soils, radish and onions do not require thinning; in heavier soils radish can be thinned to 2in. apart.

Skirret

Though skirret had a fairly-wide use in the past, its rather earthy flavour is not much appreciated now because of the greatly increased quality and variety of other vegetables available. It is a hardy perennial grown for its sweet-flavoured edible roots and can be grown by sowing seed or by planting tubers usually in September or October. The rows should be 12in. apart and the plants 8in. apart in the rows. A light, well-drained, moderately-rich soil that is free from stones is best. Seeds should be sown in groups of three or four and thinned when 2in. high so that only the strongest is left. In districts which experience severe winters it can be lifted. the leaves removed by twisting, and the tubers stored in sand in a cool, dry outbuilding or cellar.

Spinach, Silver Beet, Spinach Beet

A well-drained and well-cultivated soil that is rich in organic matter such as farmyard or stable manure should be chosen for such subjects as spinach, silver beet. and spinach (or perpetual) beet. Seed should be sown ½in. deep in rows 1ft. apart. Spinach beet and silver beet can be set out or thinned 8in. apart. Spinach can be thinned 3in. apart, though if it is sown thinly in a rich, well-cultivated soil. thinning in the accepted sense should not be necessary; it can be confined to the removal of young plants when large enough for use.

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CARE OF LIVESTOCK DURING SEPTEMBER

Contributed by the Animal Research Division.

MASTITIS IN DAIRY COWS

PENICILLIN cream for the treatment of mastitis is now readily available and full directions for its use were given in an article in the July "Journal." To get the best results these must be followed carefully. Farmers who have not attended veterinary demonstrations of the use of this new product, which have been held in most dairying districts, should consult a veterinarian concerning the correct method of administration.

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COCCIDIOSIS IN POULTRY

To prevent coccidiosis in chickens it is necessary to keep them growing steadily. Any check is dangerous. Cleanliness is very important, as the disease spreads through the soiling of food by droppings. If an outbreak occurs, sulphamezathine should be used in the drinking water. Full particulars of the dosage may be obtained from the Department of Agriculture's Poultry Instructors.

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RICKETS IN POULTRY

Chickens reared without access to sunshine are liable to suffer from rickets. This can be prevented by using in the mash an oil with a guaranteed chick-tested vitamin D content of not less than 100 international units per c.c. A pint and a half of oil should be mixed with every 100lb. of mash.

* * *

HAY AND SILAGE SUPPLIES

All dairy and sheep farmers should now be thinking about shutting up pasture for conservation as hay and silage. Dairy farmers should conserve not less than ½ ton of hay and 3 tons of silage for every cow and yearling and ¼ ton of hay and ½ ton of silage for every calf they intend to winter. Sheep farmers who do not grow supplementary crops should provide at least 4 tons of hay for every 100 ewes. This amount is necessary to keep ewes in condition if they have to be shut up as a precaution against facial eczema.

* * *

FEED NEWLY-CALVED COWS WELL

Though cows which calve in good condition will milk well during the first few weeks on poor feed, they may jeopardise their health in doing so. It is therefore important that cows should be fed well immediately after calving. If adequate pasture is not available, supplementary feed should be given.

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DOCKING OF LAMBS

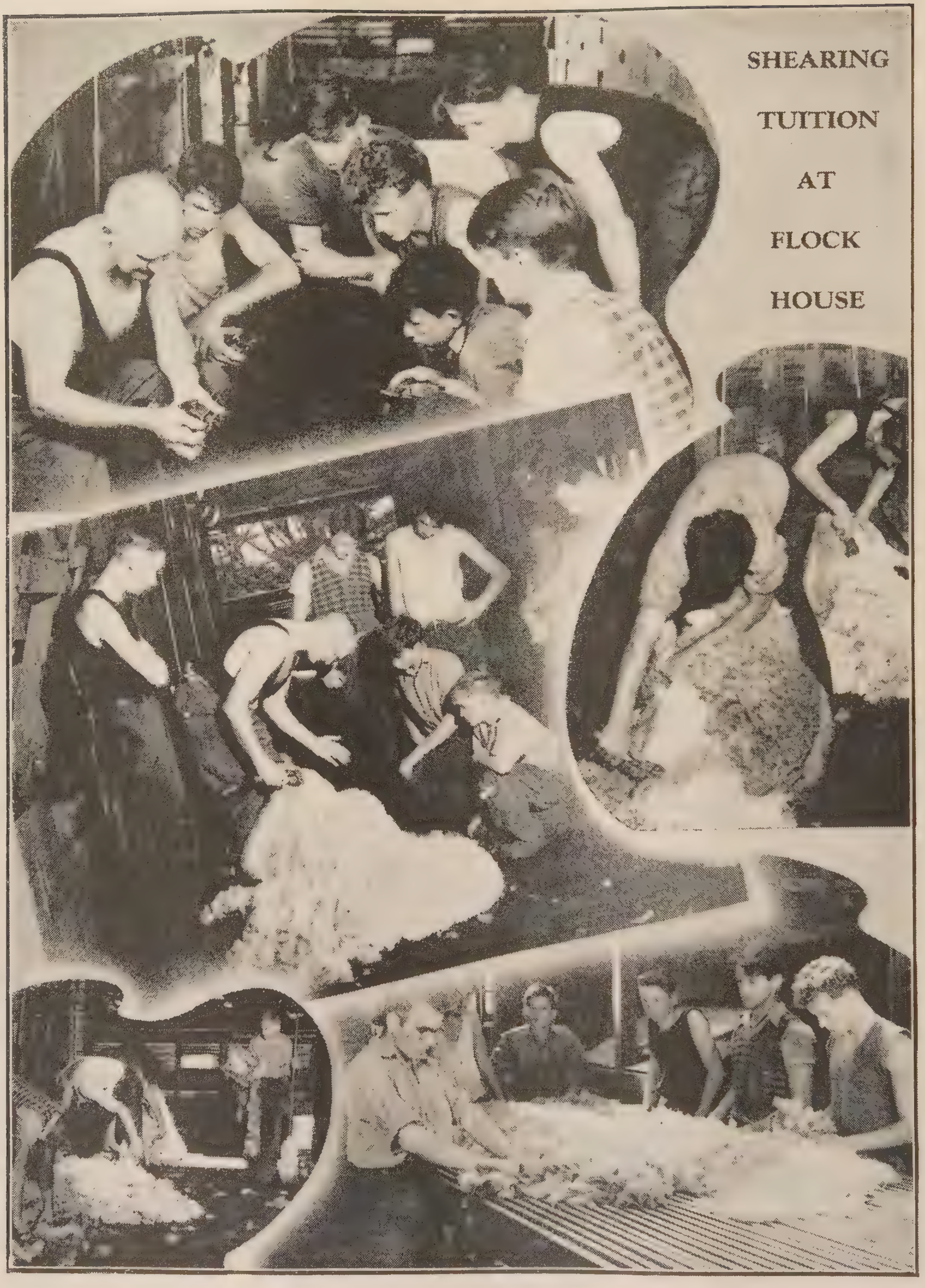
Blood poisoning after docking appears to be increasing in New Zealand. This can best be prevented by erecting temporary yards in clean paddocks. Instruments should be frequently washed in an antiseptic solution, but this will not be effective if the operation is carried out in yards which have previously been used and are consequently infected with the germs responsible for blood poisoning. If deaths have occurred in previous seasons in spite of the above precautions, it may be necessary to vaccinate the lambs, and veterinary advice should be sought.

* * *

CREEP FEEDING OF PIGS

Heavy weaners are essential to high returns from pigs, and a 40lb. weaner should be the aim of every breeder. This weight will not be obtained unless creep feeding is practised. Straight meat meal will give good results if offered dry at the rate of 2oz. per pig per day at 3 weeks, and the ration should be gradually raised to ½lb. by weaning time. In addition skim-milk or whey should always be available.

SHEARING TUITION AT FLOCK HOUSE



Instruction in Shearing Technique

METHODS ADOPTED AT FLOCK HOUSE

By J. H. HITCHCOCK, *Farm Training Supervisor, Flock House Farm of Instruction.*

WITH 35,000,000 sheep and lambs to be shorn, New Zealand is at present having great difficulty in finding sufficient trained shearers. Various schemes have been instituted throughout the Dominion to help alleviate this shortage by providing special classes and individual instruction for men prepared to learn shearing. Because of this urgent need for trained men a comprehensive scheme by which all trainees are taught shearing, crutching, and relative jobs such as wool skirting and rolling, pressing, etc., has been incorporated in the curriculum at Flock House Farm of Instruction.

TRAINEES who arrive in the January and May drafts are fortunate because they are taught to crutch first, which assists materially in making the trainee familiar with the handpiece and the handling of the sheep, and he learns to shear more easily. Before shearing, trainees are given tuition in the care and maintenance of shearing machines, the fundamentals of woolclassing, and the theory of shearing. Trainees are also taught to make a pair of sack moccasins, which are an essential part of the shearer's equipment.

Wide Gear Used

The large woolshed at Flock House contains six shearing stands, and there are three popular types of handpieces. Wide gear is used for all instruction and it has been found that it is just as easy to teach a learner on wide gear as on narrow gear. In the North Island all sheep are shorn with wide gear and experience has shown that there is no advantage in teaching initially with narrow gear before changing over to wide gear.

As the trainees at Flock House are between 15 and 18 years old, care has to be taken to see that the job is not beyond their strength and ability, particularly in the case of lightly-built boys of 15 and 16.

As one instructor could not possibly teach shearing, skirting, rolling, pressing, and handling of the wool generally to six trainees, an experienced shearer was engaged to give tuition. An instructor was also obtained to teach the trainees first to pick up and throw a fleece correctly; then to skirt and roll, and finally to press and sew the wool bales. It was not possible to teach woolclassing thoroughly, but all trainees received first-hand knowledge of the subject, and the instructor, as he classed, explained why a fleece was placed in a certain class. Trainees were invited to class with the instructor and to nominate the class for each particular fleece.

System Adopted

Shearing at Flock House was done in three stages: Shearing of dry sheep (hoggets, 2- and 4-tooth ewes, rams, killers, etc.) was done in October, the main shearing in late December and early January, and a third shearing in late January of the balance of the lambs.

The system adopted to teach trainees the initial principles of shearing was briefly as follows:—

Each day 12 trainees were selected from a roster. While six trainees were on the shearing board being given instruction the remainder were detailed to pick up fleeces, skirt, roll, and press. At the end of each run the two sets of trainees exchanged duties. There was no early run before breakfast (as is customary at normal shearing) during the initial training, and in the four runs of the day each trainee devoted two runs to shearing. As there were only 30 trainees in residence at the time and as the total initial training period was for a fortnight, each trainee received about 20 hours' intensive tuition in shearing and 20 hours' training in shed activities.

A practical demonstration of shearing by the shearing instructor and the writer in which the main hold and blows were explained as the sheep was shorn was the first stage of tuition. Trainees were then taught to shear the last side. Once that had been mastered they took over the sheep at the commencement of the long blow and after that had been dealt with satisfactorily students progressed to the next position, until finally they were ready to pull a sheep out and shear it completely. In the main eight hours' shearing tuition was necessary to reach this stage.

Remarkable Progress

Once the trainees were able to shear a sheep completely the instructors, taking three stands and three trainees each, corrected and advised trainees as they progressed. By the end of the fortnight some of the trainees had made remarkable progress and all had grasped the fundamentals of shearing and could get the fleece off. Naturally, the degree of aptitude of the learners varied and with it the relative efficiency reached by trainees at the conclusion of the initial fortnight of intensive training. At the end of this fortnight tuition by both instructors ceased, and as three shearers now came in to complete the balance of the dry shearing, three stands only were available for trainees. Trainees still under the directions of the wool instructor ran the shed and the writer continued with shearing instruction for trainees on the three available stands.

Shortly after the completion of the dry shearing and to enable the trainees to get as much practice as possible, trainees undertook to shear a neighbouring farmer's ewe flock, which they did to the complete satisfaction of the owner.

Additional Practice

The main shearing at Flock House did not give much opportunity for further shearing tuition, as four shearers were brought in for the work, leaving only two stands available for trainees. The two stands were used to the utmost and by the completion of the main shearing some of the learner-shearers were showing great promise.

The late-January lamb shearing was all done by trainees, and the lambs were put through in good time, the best tally for the six trainees for a day being 489.

Of the 30 trainees 25 now have a really good knowledge of shearing and all, should they desire to continue with shearing, could become quite good in a very short time.

Because Flock House trainees learn to shear at an earlier age than is usual, they were not allowed to shear continuously for a full shearing day. The greatest emphasis is placed on thoroughness, and the maxim was: "Learn to hold and shear your sheep correctly, and pace will come automatically." Trainees saw this demonstrated clearly in their own progress.

It was quite common for trainees to take 15 to 20 minutes or even longer in shearing their first sheep completely, but by the end of the season at least half of them could shear a sheep in 5 to 6 minutes, and what was more important, shear it well. The fact that such promising learner-shearers could be developed in such a short time augurs well for the future.

A competition conducted in connection with the shearing tuition created great interest among neighbouring farmers and a large gathering saw the final, the winner of which secured a total of 97 points out of a possible 100.

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Levy on Market Value of Rabbit Skins

A LEVY equal to 10 per cent. of the full market value is imposed on all rabbit skins sold during the period June 16, 1948, to May 31, 1949, inclusive, according to a recent announcement by the Minister of Agriculture, the Hon. E. L. Cullen. As auction sales of rabbit skins are concentrated in Dunedin, collection of the levy will be handled in the district office of the Department of Agriculture there.

IN accordance with the Rabbit Skins Levy Regulations just gazetted, the levy is payable on all auction sales of rabbit skins by brokers and on all purchases by wholesale traders direct from rural vendors. Brokers must include the amount of the levy in invoices for purchases, and wholesale traders or manufacturers must pay the levy to brokers, who are responsible for its payment to the Department. Wholesale traders buying skins direct from rural vendors must pay the levy when furnishing their monthly returns to the Department.

Effect of Regulations

The purpose of the Rabbit Skins Levy Regulations, 1948, which came into force on May 25, is to provide the machinery for the payment and collection of a levy on skins produced and sold in New Zealand in terms of section 13 of the Rabbit Nuisance Amendment Act, 1947.

"A wholesale trader" is defined by the regulations as a person engaged in exporting rabbit skins from New Zealand or in selling rabbit skins to manufacturers for the purposes of their business. "A rural vendor" is defined as the owner by whom or on whose behalf rabbit skins are first sold directly to a wholesale trader or through a broker by auction.

Regulation 4 requires every person who carries on business as a broker or wholesale trader to notify the collector (the District Chief Clerk, Department of Agriculture, Dunedin) of the fact that he is carrying on such a business, the address of his business, and the name under which it is carried on.

Under Regulation 5 no person other than a broker or wholesale trader may sell rabbit skins to a manufacturer and no manufacturer may buy rabbit skins otherwise than from a broker or wholesale trader. Brokers must sell rabbit skins only by auction, and bids are to be accepted only from wholesale traders or manufacturers.

Under Regulation 7 the levy is to be payable on all sales of rabbit skins by a broker by auction and on all sales by a rural vendor directly to a wholesale trader.

Regulation 8 provides that exporters of rabbit skins—that is, wholesale traders—when entering rabbit skins for export must produce to the Collector of Customs at the port of entry a certificate signed by the exporter to the effect that the levy has been paid on the skins comprising the entry for export, or that at the time of purchase of the skins comprising the entry for export no levy was in operation.

Under Regulation 10 the person primarily liable for payment of the levy is the wholesale trader or the manufacturer by whom rabbit skins are bought either from a broker by auction or directly from a rural vendor.

Regulation 11 requires wholesale traders or manufacturers buying rabbit skins at auction to pay the levy to the broker when making payment for the skins. If the levy is not paid by the 14th of the month following the month of purchase, 10 per cent. additional levy is to be added, but the Minister, or the collector with the authority of the Minister, in any particular case may allow further time for payment before imposing the additional levy.

By Regulations 12 and 13 brokers must include the amount of the levy in the invoice for the purchase price of rabbit skins sold at auction and must collect the levy and pay it to the collector. For this purpose brokers must furnish to the collector monthly returns showing all sales by auction, the returns to be accompanied by the amount of the levy received by the broker.

Regulation 14 requires wholesale traders buying rabbit skins directly from rural vendors to furnish the collector with monthly returns of all skins so bought, the returns to be accompanied by the amount of the levy payable.

Under Regulation 15, if the levy payable by the wholesale trader is not paid by the 14th of the month following the month in which the purchases were made, 10 per cent. additional levy is to be added, but with the same tolerance for late payment as is applicable to purchases at auction under Regulation 11.

Under Regulation 16 the collector is authorised to require, by notice in writing, any broker, wholesale trader, or person engaged in the treatment of rabbit skins to deliver to the collector, within the time specified in the notice, such informaion or returns relating to the sale, purchase, or treatment of rabbit skins as may be specified in the notice. Any such returns or information required are in addition to the monthly returns required from brokers and wholesale traders.

Regulation 17 provides that, where the levy has previously been paid on rabbit skins that are resold by auction, a refund may be claimed by the original payer of the levy. The amount to be refunded shall be the amount of the levy payable on the resale of the skins, but shall not exceed the amount of the levy paid on the earlier sale.

Under Regulation 18 every broker, wholesale trader, manufacturer, or person engaged in the treatment of rabbit skins is required to keep proper books and accounts in which shall be recorded full particulars of all transactions in respect of the sale, purchase, or treatment of rabbit skins. Such books and accounts must be preserved for at least two years after the completion of the transactions to which they refer.

Regulation 19 gives the collector, or any officer of the Department authorised by him, access to all premises used for the storage, treatment, or marketing of rabbit skins for the purpose of inspecting any rabbit skins, books, accounts, catalogues, or documents relating to the storage, treatment, or marketing of rabbit skins. The regulation authorises him to take copies of or extracts from any such books, accounts, catalogues, or documents.

Regulation 20 makes it an offence to fail to comply with any of the provisions of the regulations, to make any false or misleading statement in any certificate, declaration, or return required by the regulations, or to resist, obstruct, deceive, or attempt to deceive any person carrying out any power or function under the regulations. It prescribes a maximum fine of £20 for a breach of the regulations, or, where the offence is a continuing one, a fine not exceeding £2 a day or part of a day during which the breach continues.

By the Rabbit Skins Levy Fixation Order, 1948, the rate of the levy to be charged on rabbit skins produced and sold in New Zealand has been fixed at 11.1 per cent. of the price paid or payable by the buyer of the skins at auction or by the wholesale trader when buying direct from a rural vendor. That is equivalent to a rate of 10 per cent. of the full market value of the skins. The Order came into operation on June 16, 1948, and will continue in force until May 31, 1949.

Early Attention to Dehorning of Calves Is Important

WITH the new season under way, dairy farmers will be starting to rear a further crop of calves for herd replacement, and dehorning is a matter which requires early consideration. There is no question that the use of the caustic soda or potash stick is the most satisfactory way to deal with calves.

TREATMENT can be carried out when the calf is a few days old. The horn buds can easily be felt with the fingers, and the hair round them should be clipped off and the moistened caustic soda or potash stick rubbed over and round the buds. If wet weather is experienced about the time the operation is carried out, the caustic may be weakened and where there are any doubts about the success of the treatment a second application should be made a week after the first. The caustic will destroy the horn-secreting tissue and prevent horn growth.

Alternative Treatment

The caustic treatment is undoubtedly the most satisfactory, but where calves have been allowed to become older before dehorning has been attended to the removal of the horn bud with a sharp surgical knife is recommended. The hair round the bud should first be clipped off, the bud and skin then raised with strong forceps, and a clean incision made so that the entire bud is removed at its base. Stockholm tar should be applied to the wound to arrest bleeding and to prevent subsequent infection.

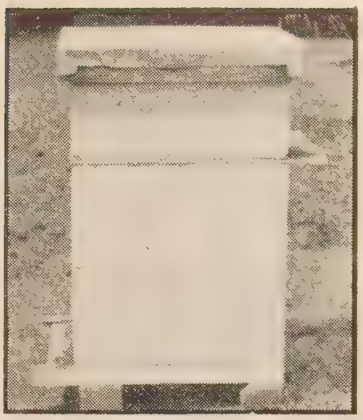
Though there may be some objection to dehorning in the case of pedigree animals, there can be no objection in the case of grade herds. Dehorning, if left until the cattle are fully grown, is a more difficult operation and one likely to cause disturbance in the herd. The large amount of damage to hides from goring, injury to udders, injuries from barbed wire indirectly due to goring, restlessness, and lower production in animals make dehorning a necessity in a well-managed herd. It is essential, too, in the case of dairy bulls, which are often reported as having inflicted severe injuries, sometimes with fatal results, on a farmer or some member of his family.

COBALT DEFICIENCY

Recommendations made jointly by the Department of Agriculture and the Cawthron Institute for the prevention of bush sickness by the use of cobalt are contained in Bulletin No. 180, "Cobalt Deficiency in Sheep and Cattle." This bulletin may be obtained free from any office of the Department of Agriculture.

Two-queen Colonies can Increase Honey Production

WITH correct management the use of two queens per colony for part of the season can increase the honey crop considerably without adding to the number of hives, and serve the threefold purpose of effectively controlling swarming, enabling requeening to be done efficiently, and creating a greater bee force. The period for which it is necessary to retain both queens in each colony depends on locality and can thus be determined only by experience, though seasonal conditions may prolong or reduce the normal period. This article by R. S. Walsh, Apiary Instructor, Auckland, describes how the two-queen system has been used successfully for several seasons by a beekeeper in the Auckland district.



A hive divided by a wooden division board.

MISS E. THORPE, of Opaheke, has operated an apiary of 45 colonies under the two-queen system for a number of years, and though this locality is by no means first-class beekeeping country and is heavily stocked with bees, she has achieved some remarkable results. In the 1944-45 season, which was an average one for the Auckland district, she obtained 90lb. per colony, and in the extremely-poor season of 1945-46 she averaged 74lb. per colony. In the past two seasons, which have been good, she has had a yield of 170lb. per colony.

The two-queen system should succeed in any district suited to beekeeping. However, unless there is some nectar available in November, the cost of feeding would probably be prohibitive. It is of great value where honey flows are of long duration, but even during a short flow it has proved capable of excelling the returns obtained from hives headed by a single queen.

Hives in some districts are slow to build up in the spring, and though this may be considered a disadvantage, it is by no means so, as it is unnecessary to install the second queen before the main hives are well forward. It would serve no useful purpose to set the operation in motion too early, as a cumbersome amount of equipment would have to be adjusted later, resulting in unnecessary labour and loss of time.

In the Opaheke district preparations for swarming become evident about mid-October, and it is about this time that the hives are prepared for the first step in the two-queen system. Miss Thorpe breeds her own spring queens, as she considers the raising of cells and their introduction to the divided portion of the hive more successful than efforts to persuade the bees to accept mated queens at this period of the season. This difficulty is not likely to be experienced in every district, and therefore where acceptances of introduced queens are reasonably good a considerable advantage will be gained. It is the opinion of the writer that if a reliable source of supply is available, the introduction of laying queens, particularly in late districts, will greatly assist in the accomplishment of the plan.

Division Boards

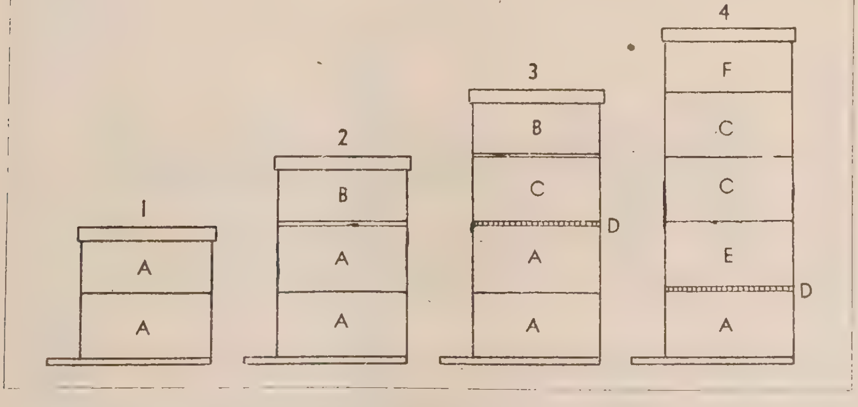
Colonies should be divided for the reception of the second queen at any time between mid-October and early November according to swarming indications and local knowledge of the likely date of the commencement of the main honey flow. Enough division boards should be available for all hives considered strong enough to be divided successfully. Colonies with less than eight frames of brood would be unsuitable, but any of these weaker hives with good queens could be brought up to desired strength by using brood from very strong colonies.

Timber ¼in. thick, heavy tin with wooden rims around three sides, or double screens can be used for division boards. Boards made from wood give good service if made from a single block of timber, but if made up from two or more lengths, the heat of the colonies will almost certainly shrink them, allowing the bees through. Division boards made of tin are excellent, but are inclined to sag from the weight of the colony resting on them when, as is necessary at times, both hive and bottom board are lifted to the ground. Double screens are perhaps the best type of division or bottom board for the purpose. Wire gauze is attached to either side of a wooden rim ¼in. thick, and a 3in. by ⅜in. cut is made at one end to provide an entrance for the bees. The ¼in. space between the screens prevents any communication between bees in either colony and has the advantage of permitting the heat of the stronger, lower hive to reach the division above.

Making the Division

The division or nucleus is made from what may be termed the parent colony. Four frames of hatching brood with adhering bees, two frames of honey and pollen, and three empty combs are arranged in a super, which is set upon the division board, and the whole is placed over the main hive. An extra frame of bees should be shaken into the nucleus, as only the young bees will remain with the division, and for this reason as much hatching brood as possible should occupy the brood frames supplied. The space left in the parent colony should be filled with good, empty brood frames. If cells are to be used, the entrance of the nucleus should face toward the rear of the main hive, but if laying queens are introduced, entrances may face the same way as the parent colony.

It is advisable to block entrances of newly-made divisions loosely with green grass, and care should be taken,



The four steps in the two-queen system. 1—A two-storey colony before making the division. 2—Colony after division, with new queen introduced. 3—Supering of the parent hive. 4—Colony after reduction to single-queen unit, with brood and honey adjusted. A—Brood chamber. B—Division. C—Super with honey. D—Excluder. E—Unsealed brood. F—Sealed brood.

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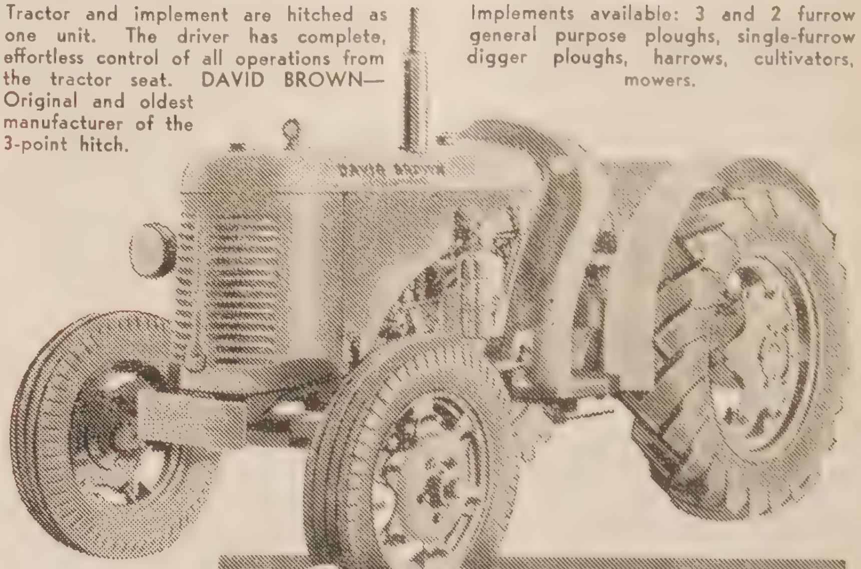

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USE OF TWO-QUEEN COLONIES

Portion of Miss Thorpe's apiary, showing hives in the early stages of being united by the paper method.

of course, to see that the queen is not transferred with the bees from the parent colony. The caged queens or cells, whichever are used, should be introduced immediately. As with all manipulations in bee culture, the operation will be more successful if there is a light nectar flow.

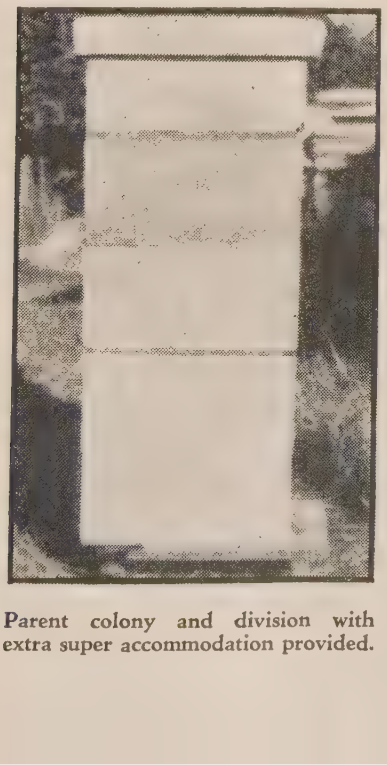
The desire of the bees to swarm will almost certainly now be quelled, but it will be necessary to examine the nuclei in eight days and remove any cells that may have been started. When the young queen mates or is safely introduced it is advisable to clip her wings as a means of recording her age. If the early honey is of poor quality, the extra force of bees that will be reared from it will ensure the elimination of the bulk of it and its replacement by a larger surplus of good-quality honey later in the season.

Early Supering

Within a fortnight, according to weather conditions and available nectar sources, additional room may be required by the parent hives. The division is lifted off and a queen excluder added to all parent colonies showing signs of congestion. A super of drawn combs is placed above the excluder and the division is then set above the extra super.

The division should be examined at this time, as it is imperative that the queen should have ample room for expansion of the brood nest. As it is not desirable to permit her more than ten combs in which to lay, it is important that these brood combs remain reasonably free of honey, and if neecssary the division should also receive an additional super for honey storage.

As in the case of the parent colony, a queen excluder should be placed above the division and a super of combs added. A half super is quite satisfactory, but all combs in the brood nest that have been filled with honey must be replaced with empty brood combs. The division may be given extra ventilation by raising the brood chamber on ¼in. blocks placed at the corners of the end at which the bees enter.



Parent colony and division with extra super accommodation provided.

Reducing to Single Unit

It is not possible to set a specified time limit for reducing the dual-queen colonies to a single-queen unit, as this would probably vary from year to year in an average district.

The aim of the whole plan is to have the colonies reach their maximum strength immediately before the main honey flow. If both queens are retained too long, the beekeeper will be faced with readjusting a large amount of equipment and much heavy lifting.

When colonies have been reduced top supering is practised for the remainder of the season. The time for final manipulation in the Auckland district in a normal season is the first week in December. As all colonies do not make the same progress, those that have not reached the desired standard by that time may be reduced later or assisted with brood and bees from any weaker hives in the apiary. The old queen is found and destroyed, the excluders and division board removed, and the bees of both parent hive and division united by the paper method. The bees are then allowed a week in which to settle down before the brood and honey are readjusted. At the end of this time the young queen is found and confined to the lower brood chamber by means of a queen excluder. She is given two frames of hatching brood and seven or eight frames of drawn comb. The whole of the unsealed brood, followed by the supers containing the honey and then the sealed brood, is placed immediately over the queen excluder. In eight days each frame of brood above the excluder must be examined for queen cells and any discovered should be destroyed.

The return to a single brood chamber at the beginning of the main honey flow appears satisfactory in the Auckland district, but a double brood chamber may be more suitable for some districts. The arrangement of the brood where two brood chambers are used is approximately the same. The lower brood chamber should consist of four hatching frames of brood and five empty brood combs, and the unsealed brood should occupy the upper chamber. The honey should be placed immediately above the excluder and the rest of the hatching brood above the honey.

The period in which both queens occupy the one hive is ended when they have achieved the purpose for which they were intended—the control of swarming by the division of the colony, the introduction of a young queen, and the final adjustment of the brood with consequent distribution of bees. By this method requeening of colonies is accomplished under ideal conditions and hives are populated by enormous numbers of bees reared on the early honey of poorer quality.

Wintering

In the Auckland district colonies continue to breed heavily until the early winter months, and if the whole of the winter stores are left on colonies in the autumn, unrestricted breeding continues, with consequent consumption of stores intended to carry the bees through until the following spring. Miss Thorpe solves this problem by wintering the bees in a single brood chamber and keeps the bulk of the stores in the honey house. The shortage of honey restrains the queen, and breeding is kept in check by feeding out the frames of honey sparingly until the queen is required to accelerate her output of young bees. Another advantage claimed for wintering in one brood chamber in this district, where pollen is over-abundant, is that the bees use up all the pollen in the brood nest, whereas, if wintered in double brood chambers, they would exist almost entirely on fresh pollen. It is sometimes necessary to winter a division over a parent colony, and where this is done an empty half super should be placed between the two colonies as an aid to ventilation.

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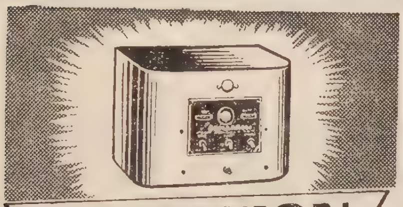

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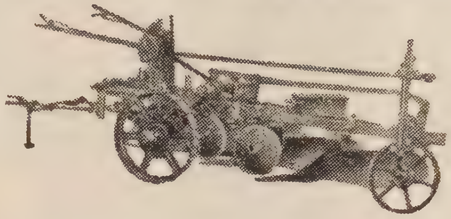

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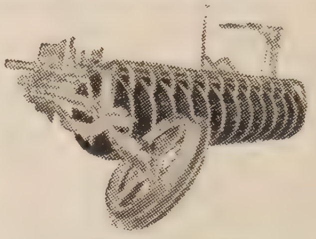

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Improvement of Inherited Qualities of Breeding Pigs

THOUGH management must be the final controlling factor in the economy of production and quality of pig meat, results are governed by the inherited characters passed on to their progeny by the breeding stock. Much can be done in New Zealand to improve the genetic make-up of breeding pigs to achieve both efficiency and uniformity of performance, and this article by A. Longwill, Assistant Superintendent of the Pig Industry, Wellington, deals with the problems associated with such improvement and discusses the need for the industry to establish a system of testing pedigree stock for performance.

[*National Publicity Studios photo.*

A fine-looking breeding herd of Berkshire pigs. Only the progeny test can determine their standard of performance.

THE foundation of the improvement of modern British breeds of livestock was laid in the eighteenth century by Robert Bakewell, "the father of modern livestock improvement," who in his endeavours to breed better-quality animals searched the British Isles for the best specimens of livestock available.

Realising that all of them did not throw progeny as good as themselves, he concentrated on those animals which did produce progeny of the type which suited the butcher. He was not afraid to inbreed closely with these animals which had proved their ability to pass on their good qualities, thus fixing the qualities in pure form in many of the inbred stock. However, with the exception of a few breeders who followed Bakewell's principles at different periods in the last 150 years, the lesson of his work has been very largely lost on most breeders of domestic livestock in the British Commonwealth.

Attractions of the Show-ring

The attractions and advertising value of the show-ring, where judging was based on the exterior appearance of the individual "on the day," proved too strong for most breeders. Many, however, must have felt that they were making no progress, and probably had it not been for the competition with other breeders for the advertising value of show-ring honours, they would have preferred to develop their breed society along lines which, by co-operation in recording the performance of the stock bred, would have enabled them confidently to expect sound, if slow, improvement in the economically-useful qualities of the breed as a whole.

The minor points contributing to attractive outward appearance of stock gradually assumed an exaggerated importance, and the "breeding for use" on which Bakewell's methods were soundly based became replaced by breeding for minor fancy show points even as absurd as a certain colouring fashionable at the time. It was perhaps a reflection of human nature that the rank and file of breeders followed these methods, as these external characters are inherited in a relatively-simple fashion and a certain colour or pattern could be "bred in" and fixed fairly easily. Because the inheritance of characters of economic importance is controlled by many factors, it was not easy to determine how these characters were inherited, and with the methods used in the past not much progress could be made within the lifetime of one breeder. With meat-producing animals improvement up to a reasonable standard was much less difficult than, for example, with dairy stock, because the carcass conformation could be judged up to a point by external appearances and the value of breeding stock could be appraised in a general way on the appearance and, later, slaughter quality of their offspring. Appearance is a poor guide to milk production, however, and methods of recording performance have had to be developed to give a sound basis for improvement in dairy stock.

Breeders have gradually learnt how such performance records can be made most useful. It soon became obvious that it was not a simple case of "like mother like daughter" and that the progeny of a bull were not necessarily good producers just because his dam had been an outstanding producer. In short, what mattered in the long run in breed improvement was the ability of the breeding animal to throw stock uniformly good for the characters required. This conception has led to the best means of using performance records—the progeny test. Unfortunately there are still many breeders who have failed to appreciate the necessity for such a test.

The Commercial Producer's Problem

In considering how the qualities of breeding pig stock can be improved it is necessary to examine first the requirements of the commercial producer, whose products, pork and bacon, are the ultimate end for which all pigs are bred. His breeding stock must suit his conditions and be capable of responding to the best conditions and management he can provide economically. Besides possessing this adaptability, they must perform well. Sows must be regular and prolific breeders and possess good milking and mothering ability. The progeny of each breeding animal, boar or sow, must grow rapidly, make economical use of food, and when slaughtered must produce carcasses of the highest market quality and with the optimum proportions of bone, muscle, and fat. The producer wants uniformity and regularity of performance in his breeding stock so that he can turn out a uniform product without too great a strain on the efficiency of his management.

It has been said that the commercial producer has not much choice in the quality of the breeding stock available to him, but if he studies what qualities are necessary in desirable carcasses and insists that reliable evidence of those qualities and those of good litter production and rapid and economical growth is provided by the breeder, his demand must be met. Through District Pig Councils the commercial producer has the means of making his demands known and he must take his full share of the blame for lack of progress if he fails to do so. An obvious prerequisite is that the commercial producer must be adequately

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INHERITED QUALITIES OF BREEDING PIGS

The progeny of good breeding animals. The carcass test on a fair sample of their litter mates helps to measure their true breeding value.

rewarded for the production of the desirable type of carcass and for this reason grading of carcasses in such a way as to give worthwhile price differentials for quality is fundamental.

To safeguard the future market and to promote his own efficiency the commercial producer should study the market requirements and the methods of achieving better all-round results and help in organising the industry so that these objects may be achieved.

The Pedigree Breeder's Problem

While there is no effective demand from the commercial producer for breeding stock with anything more than a paper pedigree, even though this may be embellished with particulars of show-ring successes back to the fifth generation, there is little incentive to the pedigree breeder to overcome the more difficult problem of improving the uniformity and standard of economic performance of his strain.

However, if he is to merit the name of "breeder" rather than "fancier," he must accept the responsibility of endeavouring to lay the foundations of good commercial performance in the purebred stock of the breed in which he is interested. By organisation he must go further and co-operate in a scheme of stock improvement designed to enable further sound and gradual improvement of useful characters to be made.

The basis of such an effort must be the recording of performance of all the breeder's stock. In this respect the small volume of litter recording and the complete lack of interest in the Performance Record Scheme for Purebred Pigs are most regrettable. Even the New Zealand Pig Breeders' Association's classification scheme has failed to interest more than a handful of members. If there are weaknesses in these schemes, breeders should be active in having them remedied, but inaction and complete lack of interest in the very fundamentals of improvement of the commercial qualities of purebred stock can mean only that breeders are content to follow methods which do not make for progress in the improvement of hereditary characters of economic importance.

Value of Imported Pigs

The exaggerated importance which tends to become attached to pigs imported into this country, frequently without any worthwhile utility records, is a symptom of the failure of even prominent breeders to appreciate the requirements of their job. The magic abbreviation "imp." has a commercial value simply because the trusting but untutored buyer believes that if an animal is good enough to import it must be a good breeding animal. That is how it should be, but it is not necessarily so. Importations should be made only from countries which have an efficient performance-recording scheme for purebred pigs and be restricted to individual pigs which have themselves either been progeny tested or are bred from progeny-tested stock on both sides. The progeny of such stock would be worth the extra premium which imp. secures today, often without justification.

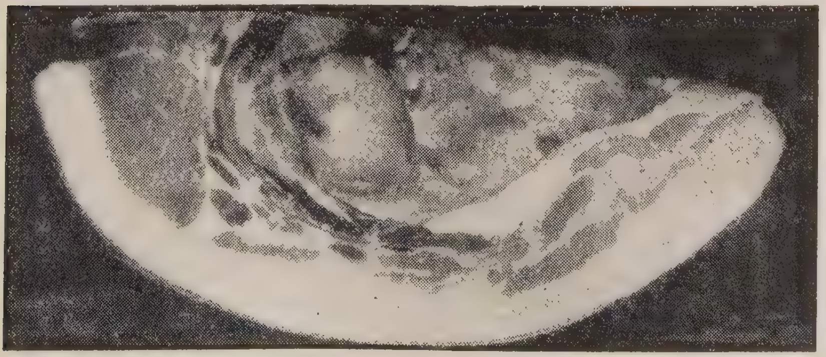
The young breeder who is going to be the successful breeder of tomorrow must take a realistic view of his task. He must understand that there are great difficulties in obtaining steady improvement in the inherent productive qualities of his pigs. Every extra quality of minor importance that he tries to breed for increases the difficulty of selection many times over, so that minor "fancy" points must be eliminated and attention concentrated on utility points, which must be judged by measurement and be clearly recorded and not merely judged by eye or external appearance.

If he is a small breeder and can afford to keep only one boar, he will find that alone his efforts are very restricted and that there is need for an organisation to help him in the selection of replacement boars which will maintain steady improvement. This organisation, having responsibility for all performance recording, would be able to publish lists of boars and sows proven on the basis of the performance of their progeny under conditions which the commercial producer can provide economically. Properly-controlled test mating would have to be carried out to ensure that approved stock were genetically free from recessive factors responsible for serious faults of conformation. This is the really valuable information to any producer. After the full standard required for commercial qualities has been reached there may be a tendency to select for external beauty points. This may be quite sound, but only if care is taken to ensure that utility points are not sacrificed in the process; the utility aspect must be regarded as first priority in every breeding plan.

The show-ring can still perform a useful function in breed improvement only if classes are radically altered to cater eventually only for stock whose performance and, more particularly, the performance of whose progeny have been recorded and are up to a specified standard.

Registration in Herd Book

The whole of these developments must be parallelled by selective registration in the Herd Book, so that in the long run performance records of a defined standard will be necessary before an animal is entered in the published Herd Book, which will become a register of tested animals. A further register of all purebred pigs born, with details of breeding, identification marks, etc., as are recorded at present, would have to be kept by the organisation.



To complete the evaluation of a carcass for desirable points accurate measurement of length, fat cover, lean meat, streak thickness, etc., must be made after general appraisal of the whole carcass.

INHERITED QUALITIES OF BREEDING PIGS . . .

The question which naturally arises from these considerations is how to set in motion the machinery which will achieve the objects outlined. For immediate needs the machinery is already in existence. The National Pig Industry Council, which brings together representatives of commercial producers, breeders, and the Department of Agriculture, is the logical body to administer a stock improvement plan of the dimensions indicated. To expedite decisions a pig stock improvement committee of the national council could be set up to deal with details of policy. However, from experience gained since schemes of litter recording and carcass testing have been available to breeders it is clear that something more is necessary to make the machinery work. The educated demand from buyers of pedigree stock for a "pedigree of performance" is one essential; a constant flow of pedigree stock through the testing scheme is the other. Both of these can spring naturally only from a realisation by the producer of both pedigree and commercial pigs of what is involved in this problem of breed improvement.

Once this realisation has been achieved the fact will be accepted by breeders in this country, as it has been for many years in Denmark and certain other countries, that only stock which has been tested and reached a specified standard of performance should be registered as pedigree stock to which the rank and file of pig raisers can look with confidence to improve the commercial qualities of their pigs.

Function of Testing Stations

The testing stations, as employed in Denmark and Sweden, perform the essential function in stock selection of providing a uniform environment in which to measure the performance of the pigs which are being compared. The control over the environment has reached a very high degree of efficiency, yet in interpreting the records of any litter group (four pigs are taken in at about 11 weeks old and are fed to 200lb. live weight) results are related to the average for the station concerned and the particular quarter of the year rather than to any broader average.

The results in terms of growth rate, economy of gain, and points for the various aspects of carcass quality are published, and it is left to the breeder or other interested person to make his own summing up. An analysis is made of the results of all pens tested and a list of "elite groups," which have scored 90 per cent. of points for bacon type and also have a food conversion efficiency better than the average for the station, is published. These are taken to indicate desirable matings which should be repeated for the propagation of further breeding stock. Similarly an analysis of the results of groups is made to evaluate the breeding value of the sires. Those from whom a minimum of three groups each performing up to specified standards of carcass quality and efficiency of food conversion have been recorded are listed as "elite boars." In this way attention is drawn to breeding animals which should have the best chance of improving the utility of the breed.

The success of these methods of stock improvement has given rise at times to discussion as to whether similar methods could be used in New Zealand. Any other system (for example, recording and carcass testing of stock on the individual farm under a system analagous to herd testing) could take Dominion producers only the first step or two in stock improvement nationally, though it might be of considerable value individually, especially to the large breeder, who would be enabled to get a more accurate comparison than hitherto of the performance of his various breeding animals and thereby improve his methods of selection as long as he was able to remain self-contained. The difficulty of assessing the value of another breeder's stock would be greater than in the case of dairy stock, as management can have an even greater influence in the case of pigs.

Though testing stations may eventually be necessary, they cannot be set up overnight, and in the meantime the first steps to sound methods of selection can be taken by each breeder sorting out more accurately his present breeding material on the basis of utility. This can be done simply by consistent litter recording and carcass testing under his own farm conditions.

JOURNAL OF THE BRITISH GRASSLAND SOCIETY
(Editor: DR. H. I. MOORE)

This Journal is the medium through which British workers on grassland and related problems give the results of their experiments and their views and experiences on questions of current interest. It is designed to supply information of value and interest both to technical specialists and the practical farmer.

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Germination of Government-approved Seeds

GOVERNMENT-APPROVED seeds, though produced under the supervision and bearing the official endorsement of the Department of Agriculture, do not carry on the container a tag showing the reference to the official purity and germination certificate covering the seed. All seed of each variety is, however, blended into one line before the season's supply is distributed, thus ensuring uniformity of quality, and the following is the germination of each class of Government-approved seed being distributed for sowing in the spring of 1948:—

Thousand-headed Kale	**90 per cent.**
SWEDE SEED:	
Superlative	**All 90 per cent. or better**
Grandmaster	
Crimson King	
Resistant	
Sensation	
TURNIP SEED (YELLOW-FLESHED):	
Green Top Yellow	**All 90 per cent. or better**
Soft Green Top Yellow	
Green Resistant	
Purple Top Yellow	
Purple Resistant	
TURNIP SEED (WHITE-FLESHED):	
Green Globe	**Both 90 per cent. or better**
Purple Globe	
Red Globe	**68 per cent.**

All germinations except that of Red Globe turnip are over 90 per cent. Though the germination of the Red Globe turnip seed is low, experience suggests that even at this figure normal sowing rates will result in a satisfactory strike of seed, but if conditions at time of sowing are unfavourable, a slightly-increased sowing rate might be employed.

BOOK REVIEW

"Handy Farm and Home Devices:" compiled by J. V. Bartlett

THIS collection of hundreds of useful suggestions for doing jobs on the farm or in the home will be invaluable to all farmers and householders. It has been compiled from ideas and inventions which have appeared in various publications in different parts of the world. The suggestions are explained in a simple, non-technical manner and each is illustrated by a drawing. They are grouped under 21 headings, and the whole is carefully indexed for quick and easy reference.

The coverage is very wide, and in addition to general hints on building, repair work, and care of tools, there are sections dealing with livestock, gardening, camping, knots and hitches, and first aid.

—H.W.T.E.

N.Z. Agents: Democracy Publishing Co., Wellington. 21s.

Thinning of Fruit Crops Essential for Best Results

By J. D. CAROLIN,
Orchard Instructor, Timaru.

FUNDAMENTAL principles of fruit culture make the thinning of fruit crops essential; neglecting to thin may mean a loss on orcharding that might otherwise have been conducted at a profit. Thinning is becoming a practice, but many orchardists still do not include it in their usual operations because it is not regarded as a necessity in the way that spraying and pruning are.

IN other spheres, however, thinning is a standard practice; market gardeners thin crops, horticulturists disbud flowers, and forestry officers periodically remove surplus trees from growing stands. The purpose of all thinning is to relieve the struggle for existence and to assist Nature in leaving room for development. In the process of natural reproduction fruit trees throughout their life often set a great many more fruits than they can properly mature, and the greater the crop the greater the strain on the tree, resulting in a heavy drain upon its food materials and resources, which generally leads to crops of small and inferior fruit.

Apple thinnings on the ground.

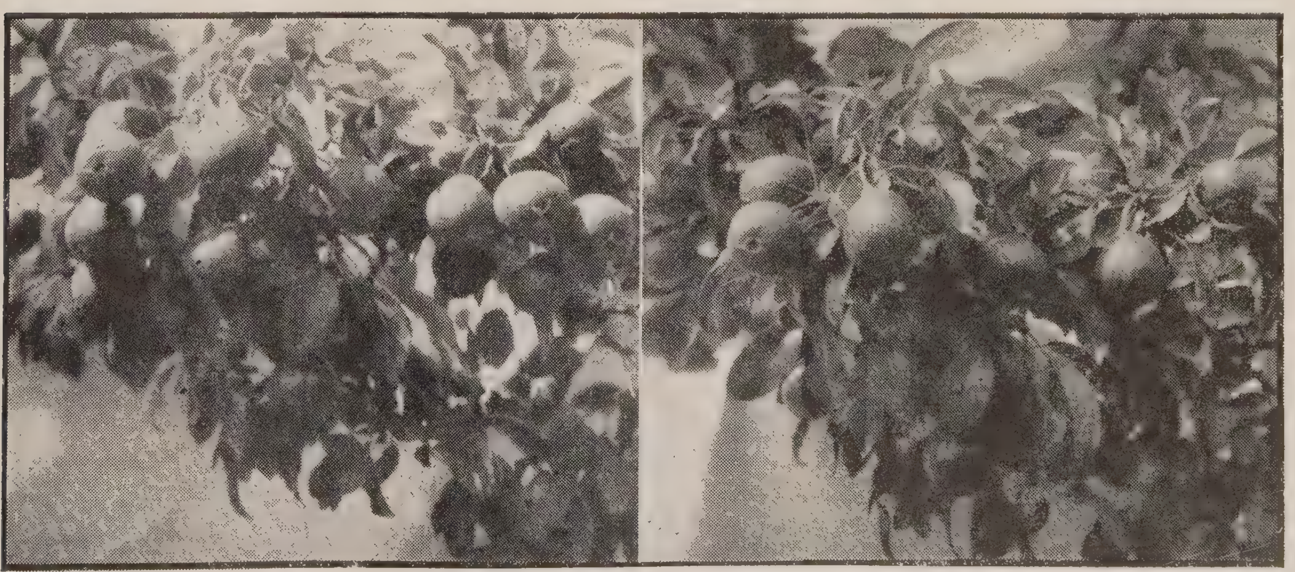
Cause of Exhaustion

The carrying of heavy crops is most exhausting to the tree; the more the tree can be relieved, without sacrificing the crop, the more it is helped to balance its life's process—wood growth, crop production, fruit and leaf bud formation, and the storing of reserved food elements. Cropping and tree growth depend entirely upon the elaborated food manufactured by the tree. This can be brought about and assisted only by systematic thinning, by not allowing the tree to overcrop, and by endeavouring to maintain a proper balance between the tree and the conditions in which it is growing.

Benefits to the Grower

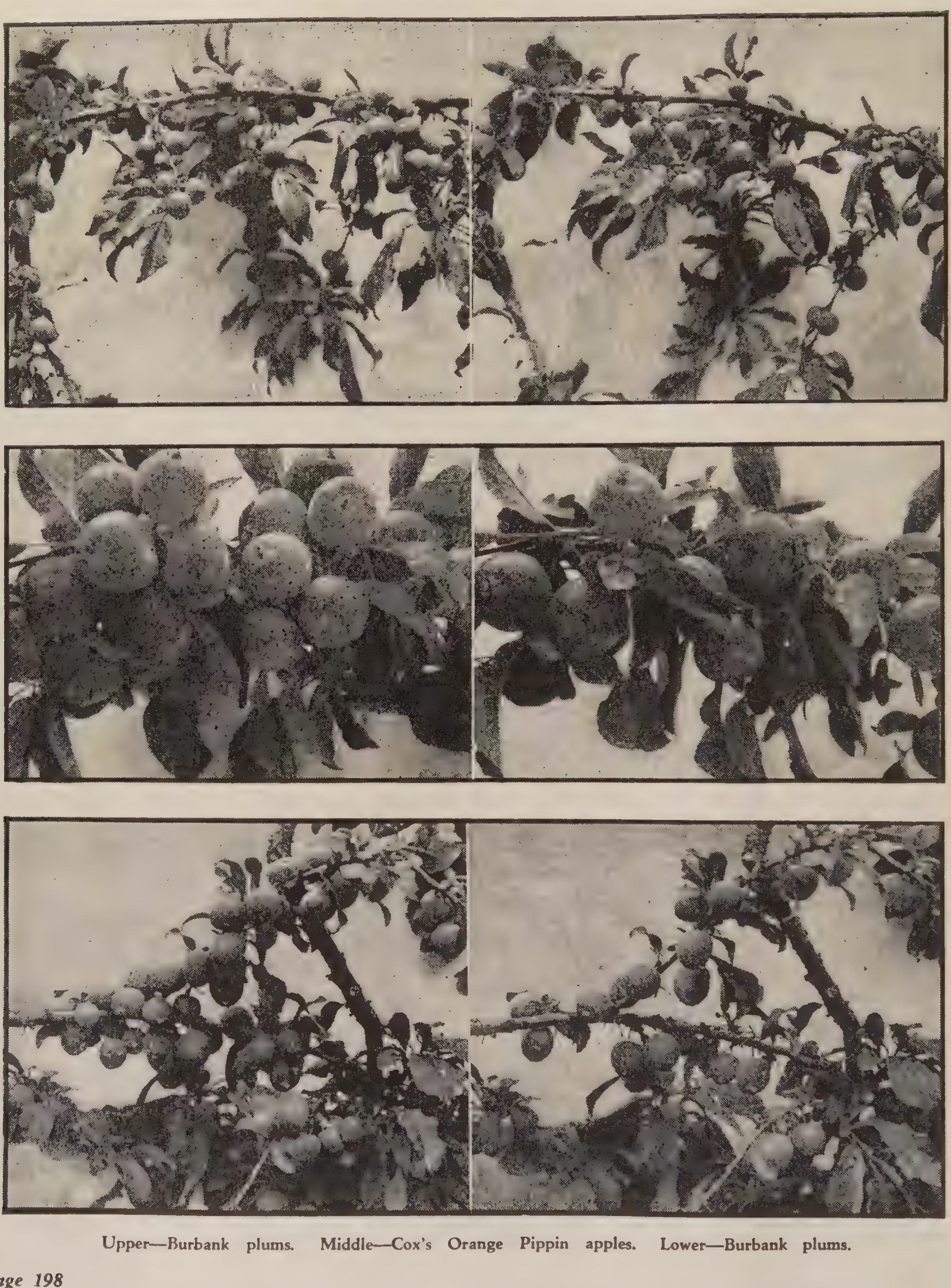
Thinning not only increases the quality and grade of the remaining fruits, but is ultimately reflected in a reduction in the overall costs of production.

It prevents over-cropping and exhaustion of the tree, whose future health and cropping prospects are not impaired, and the tree is better able to maintain its vigour and stand up to the varying seasonal climatic conditions.



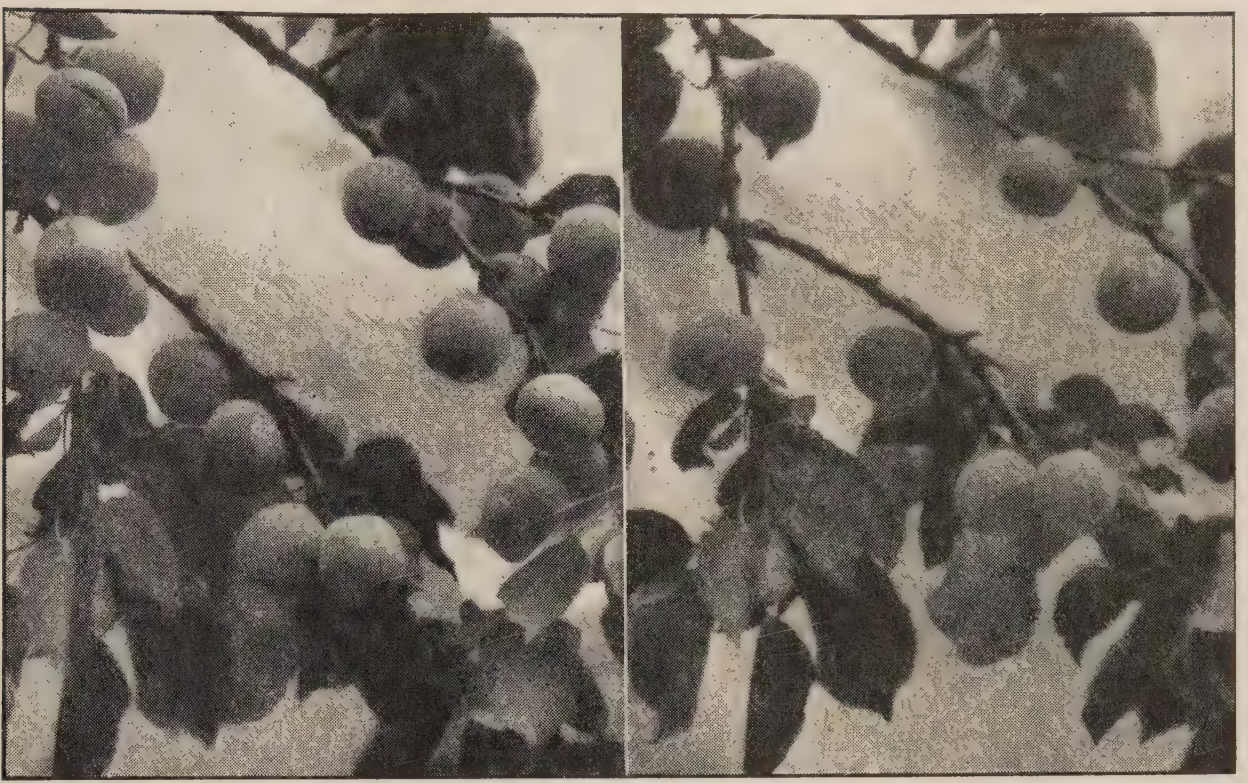
Winter Cole pears before (left) and after being thinned.

BEFORE AND AFTER BEING THINNED



Upper—Burbank plums. Middle—Cox's Orange Pippin apples. Lower—Burbank plums.

THINNING OF FRUIT CROPS



Moorpark apricots before (left) and after being thinned.

Fruits remaining on the tree develop more and usually compensate in that way for the fruit removed by thinning, especially during drought conditions, when the endeavour to develop a heavy crop places a tax on a tree.

Thinning greatly assists in controlling insect pests and fungus diseases to which the crop is liable during the latter part of the growing period. After the clusters have been systematically thinned a much better coverage and greater spray penetration can be obtained on remaining fruits for the control of leaf-roller caterpillar, codling moth, or late infections of black spot on pip fruits and brown rot on stone fruits.

The relief to the tree by thinning helps to avoid the danger of limbs breaking through being overloaded. A broken limb may provide access for the entry of diseases which may result in the death of the tree. During the close inspection of trees necessary during thinning an experienced and observant operator can note points which might otherwise be overlooked, such as the incidence of disease or russet, the type and quality of the crop which is to be harvested, the condition of the foliage, and the general health of each unit.

During thinning all under-grade fruit is, of course, the first to be removed, followed by fruits which will obviously not develop or fruits which are not evenly spaced to allow for sizing. The removal of this type of fruit means a saving to the grower in several ways: It does not incur cartage and labour costs to the packing shed; it does not have to be handled and eliminated during grading; and it does not take up valuable storage space in the shed while awaiting disposal.

The benefits and advantages of thinning outweigh any objection which might be raised to the practice.

When to Thin

No specific period can be set for thinning, nor a date when it should commence, as local seasonal conditions often tend to alter the time. The amount of crop set has also to be taken into account in considering the necessity for and the intensity of thinning.

The safest period for thinning pip fruit is generally immediately after the natural dropping, and stone fruits are best thinned after all danger of late frosts has passed. Actually the later work of thinning should be borne in mind when fruit trees are being pruned. If, besides removing surplus wood, the orchardist then systematically thins out excess fruiting wood, buds, and spurs, work at thinning time will be greatly facilitated.

How to Thin

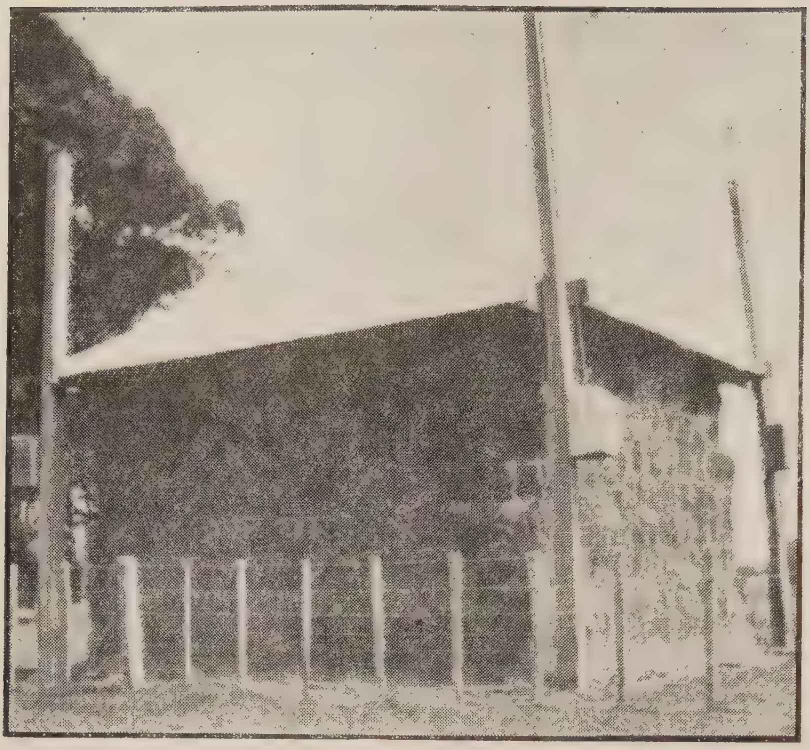
The crop which each tree is carrying and the general condition of the tree should be a guide to the amount of thinning required. A tree carrying a heavy crop but poor in growth and general condition requires heavier thinning than a tree making an abundance of tree growth. Thinning by hand is satisfactory with stone fruit, but with pip fruit there is danger of loosening the remaining fruits and rendering them liable to drop off. Loss can be avoided by using specially-designed thinning shears.

Stone fruits should be thinned so that they do not touch when fully grown. Stone fruits are short stemmed and if two or more fruits are left in a cluster the tendency is for them to push one another off as they swell and the hold of the fruit which remains is weakened.

Most pip fruit varieties have longer stems than stone fruits and thinning to singles is not so imperative, but the orchardist must be guided by the crop capacity of the tree. It is advisable, though, that at no stage should there be more than two fruits to a bud, and the buds should be well spaced.

The CONSTRUCTION of a DUTCH BARN for LOOSE OR BALED HAY

A USEFUL type of "Dutch barn" or hay shed, seen most frequently on farms in Bay of Islands and Whangaroa Counties but used in other localities, consists of four uprights between which works a movable roof, counterbalanced with suitable weights. Originally designed and used for the storing of loose hay, with the development of hay pressing it has been found equally useful for holding bales. The construction of such barns is described by E. H. Arnold, Instructor in Agriculture, Whangarei.



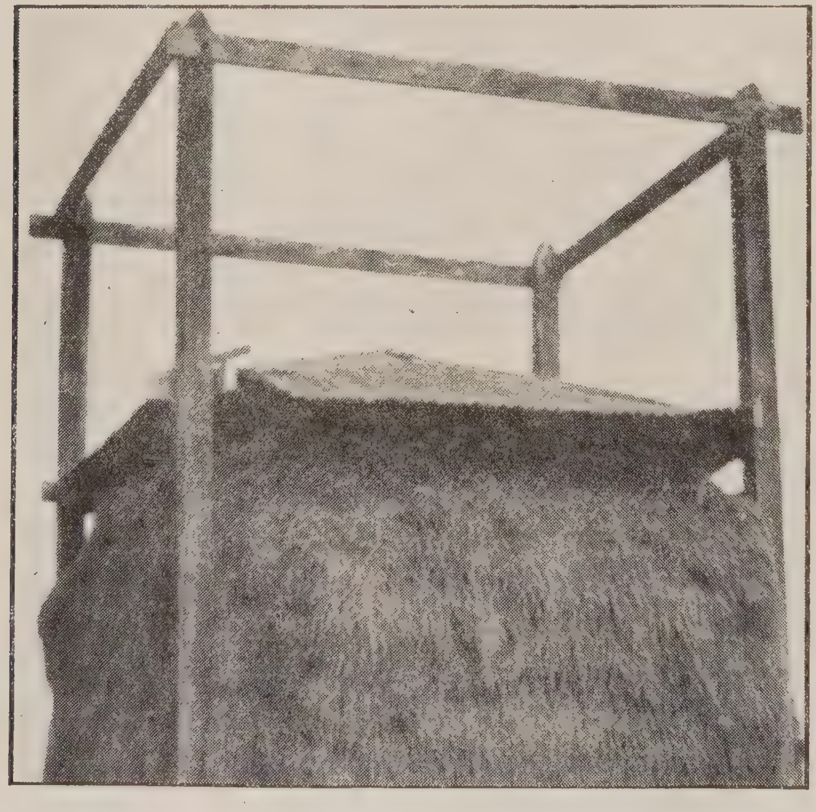
A weighted-roof type of Dutch barn containing baled hay.

SUCH barns are usually built square, the base varying between 12 and 18ft. Occasionally oblong barns are erected, a typical base measuring 12ft. by 24ft. These measurements are taken at the inside corners of the four uprights.

Uprights

For the uprights squared totara poles are used, but any other suitable timber more easily obtained locally will serve just as well. The poles can be 23 to 25ft. long, 10in. square at the base and tapering to 7in. square at the top. For rigidity and uprightness the poles are sunk into the ground at least 4ft. 6in. and either adequately footed or set in concrete. As the roof works in guides between the uprights, the inside corners of the poles should be carefully trued up and these edges kept perpendicular.

To give strength and rigidity, on some barns cross-pieces of timber, 4in. x 2in. or 6in. x 2in., are bolted across the outside at the tops of the uprights. Others have wire fastened in a similar position to prevent the uprights spreading. As they would interfere with the working of the roof, diagonal wires cannot be used.



Cross-pieces are sometimes used to strengthen the uprights.

The tops of the uprights can be bound with No. 8 fencing wire and capped with a piece of galvanised sheet iron.

Pulleys, Wires, and Weights

Two 3in. pulleys at the top of each upright to carry the wire connecting roof and counter-balancing weight are more efficient than one pulley of a larger diameter. A single strand of No. 6 wire is commonly used for suspending the roof, but with constant wear it tends to become brittle and sooner or later will break, perhaps with unpleasant results. Flexible wire rope of even smaller diameter suitable for the pulleys over which it must pass is more efficient and much less dangerous. The suspending ropes are securely fastened to the corners of the roof and the counter-weights by ¼ to ½in. eye-bolts; the threaded ends of the bolts pass through the ridge and frame of the roof, and in the weights they are firmly set into the concrete.

The four weights needed to counter-balance the roof can be made by filling used six-gallon oil drums with concrete, but square moulded concrete weights are better because they do not swing about when the roof is moved as do the round weights. They must be of equal weight, and their combined weight should be slightly less than that of the roof.

Construction of Roof

The hip type of roof with a high rise has been found far more satisfactory than a gable roof. It can be more strongly constructed and offers less resistance to the wind. For a roof 12 to 14ft. square the rise should be 5ft. 6in. The frame plates which form the base of the roof are made of 6in. x 2in. planks for barns up to 14ft. square and 9in. x 2in. for larger roofs. These are placed on edge and halved-in at each corner, the projections acting as guides running up and down the uprights.

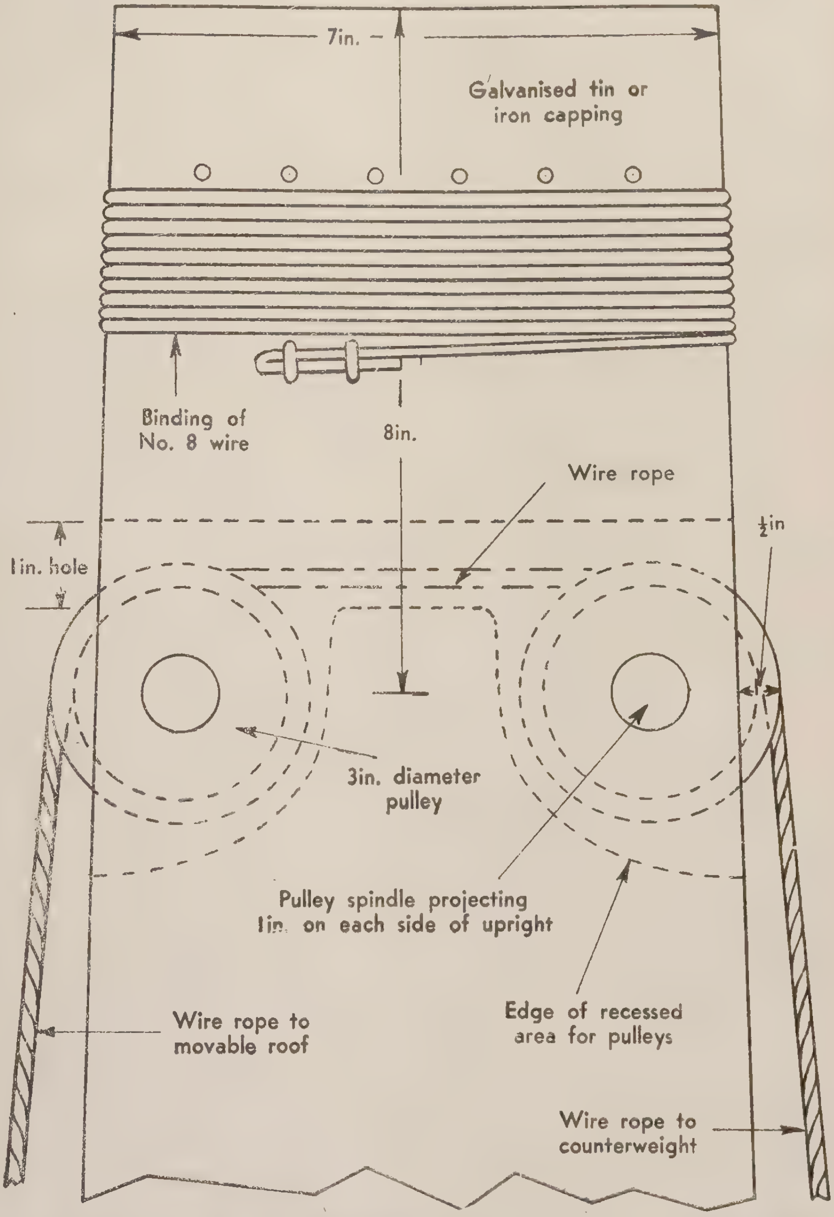
The remainder of the roof follows the usual methods of construction except that no cross- or tie-beams are used inside the roof. The corrugated iron is brought out at least level with the outsides of the uprights, with the corners cut out to allow for movement of the roof. The projection of the roofing iron does away with the need for guttering, which cannot be fitted effectively and is not usual.

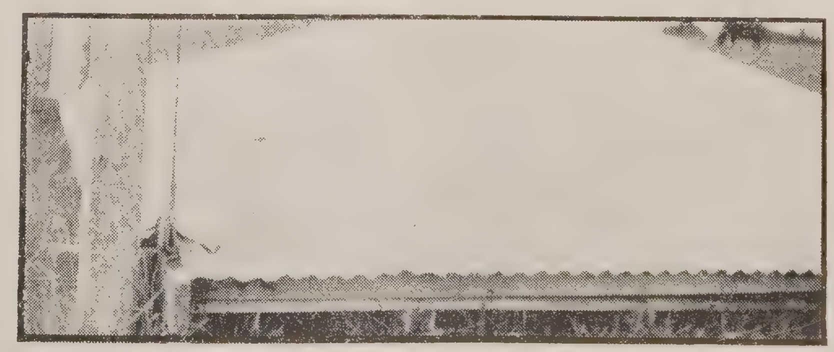
It is essential that the roof be strongly constructed or damage may be caused if during movement in high winds it makes sudden contact with the uprights.

Projecting spikes pointing slightly downward are fitted on the outside at the top and bottom of each upright. Short lengths of chain fastened to each corner of the roof and around the uprights then prevent any possibility of the roof being lifted over the tops of the uprights or moving when the barn is empty.

In most barns a foundation of logs or other suitable material keeps the hay off the ground, but some have well-constructed wooden floors on short piles and joists.

THE CONSTRUCTION OF A DUTCH BARN


7in.
Galvanised tin or iron capping
Binding of No. 8 wire
8in.
Wire rope
½in
1in. hole
3in. diameter pulley
Pulley spindle projecting 1in. on each side of upright
Edge of recessed area for pulleys
Wire rope to movable roof
Wire rope to counterweight



The barn empty, with the roof resting on the wooden floor. The extension guides are built into the base frame plates of the roof.

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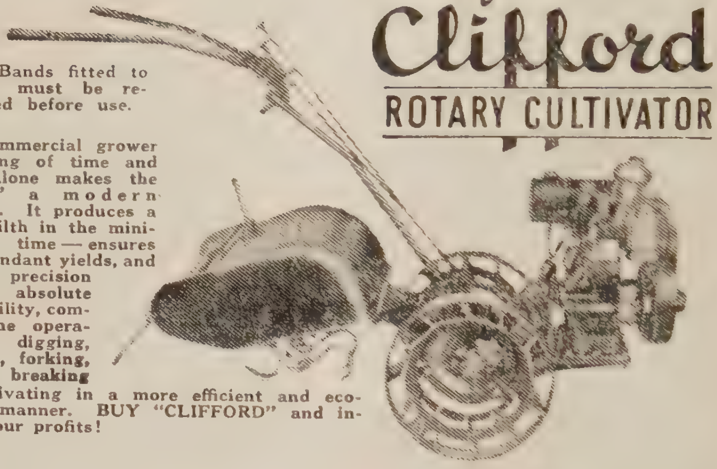

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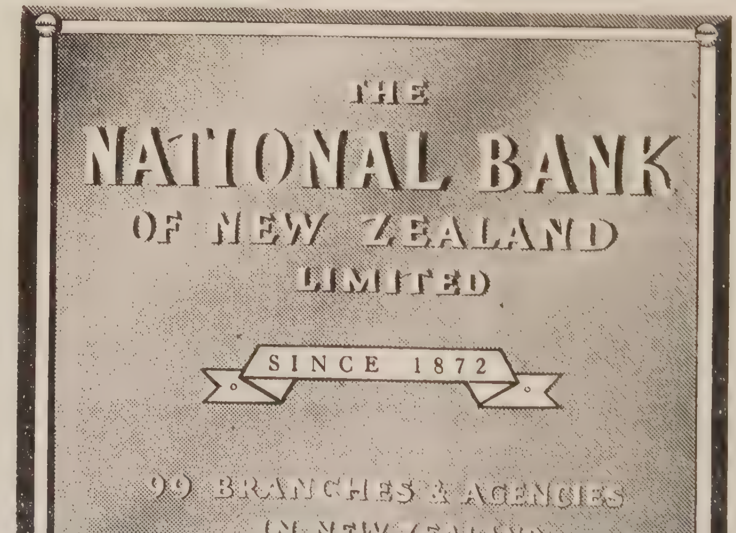

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Plant Breeding is a Satisfying Hobby for the Flower Gardener

PLANT breeding offers a stimulating and satisfying hobby to the home gardener, and may even enable him to make a worth-while contribution to the horticultural welfare of the country. In this article J. P. Hudson, formerly of the Horticulture Division, Wellington, shows how much more likely the plant breeder's work is to be successful if it is based on a knowledge of the modern science of plant breeding.

Narcissi and daffodils continue to make a display in gardens. The foliage should not be cut off after they have flowered, but should be left until it begins to change colour and die down.

LINNAEUS, the great botanist who introduced the present system of naming plants, believed that each type of plant ("species") had been growing since the beginning of time and was fixed and changeless. Within a hundred years Charles Darwin suggested that species were not immutable, but were constantly and slowly changing ("evolving") into new types. This theory of evolution implies that present-day plants have evolved from earlier, different ones, which may still exist or, more probably, have disappeared altogether. It also implies that new and improved types will gradually evolve from the plants known today, which in turn will disappear.

Gardeners know that this does happen. New varieties of flowers, fruits, and vegetables are constantly coming on the market and earlier varieties disappearing. Perusal of old gardening books or catalogues shows that many varieties which were once popular and widely planted have long since been lost. It can be supposed that those which are at present fashionable and regarded as perfect will in due course be superseded by still better varieties and will disappear entirely, not only from the catalogues but from cultivation, and probably will never be seen again.

Evolution of Present Varieties

Most of the common fruits and vegetables have been in cultivation for hundreds of years, and many, such as apples, cabbages, onions, peaches, and turnips, for more than 4000 years, as shown by carvings on ancient buildings and other evidence. Of course, during this period there have been many changes in the characters of these plants. New and slightly-improved varieties have continually superseded the older ones, which have gone out of cultivation and been lost. But the common fruits and vegetables are still recognisably the same as their ancestors of very many generations ago.

In some cases the original wild species, from which the improved forms first came, now cannot even be traced and the parentage of some of the most important crop plants can only be guessed. However, the wild progenitors of present-day fruits and vegetables probably had little to commend them as food plants, but would be passed by as of no economic importance if they still existed. Apple trees with tiny, unpalatable fruits and carrots with woody roots would not attract attention, yet the present sweet and juicy apples and succulent, nutritious carrots have evolved from such unpromising beginnings.

No doubt very many other plants at present growing wild or in the flower garden hold just as much promise of providing outstanding new flowers, fruits, and vegetables as did the first crab-apple or the wild carrot.

During the past hundred years plant collectors have been ranging the world to collect new wild plants worth introducing into cultivation. Their introductions, which number tens of thousands of species, have provided gardeners with a great range of new plants from which to choose, but so far this influx has benefited mainly the flower grower. It is really extraordinary how few completely-new vegetables or fruits have been introduced into cultivation recently, despite the widespread searches of plant collectors.

Methods of Breeding New Varieties

Modern methods of plant breeding and the scientific study of the underlying principles ("genetics") date back only to the publication in 1900 of the works of Gregor Mendel, a Moravian monk. But plant "breeders" were, of course, at work long before then. The most ancient form of "breeding" was by selection, a slow process, but one which has paid handsome dividends in the past. Selection consists simply of scrutinising carefully all plants in a batch and selecting the "best"—those which excel in some particular feature in which the grower is interested, such as size of fruit, colour of flower, or length of stem. Seed from the selected plants is saved and grown on, and again the crop is carefully searched for the best plants, from which the seed is saved, and so on.

That system, referred to as "mass selection," is still widely used for the production of seed of annuals and biennials. The results are much better if all undesirable or "off" types are pulled out before the flowers open to make sure that none of the seed is fertilised by pollen from inferior plants. A better system is to select the best specimen of all and save seed from only this one plant ("single-plant selection"), but this method has limitations which must be properly understood if it is to be used effectively.

Heredity in Plants

Every fact about a plant—its size, appearance, how it grows—is decided by its character, as inherited from its parents. The nature of the offspring of any plant will in turn be determined by the hereditary characters which it passes on to its seeds. Therefore, improvement of plants by selection is limited by the hereditary characters which the plants already contain. That may be an advantage for producing a uniform line of seed, but it is a bar to further progress when the breeder wants to develop something quite new. Fortunately there are ways in which other improvements can occur.

A completely-new and improved variety can be produced only if it has different hereditary characters from its parent (or parents), and plants with new hereditary make-ups can occur in two ways: One is by mutation or "sporting," and the other by cross-breeding (hybridising).

"Sports" and Hybrids

Mutations, the ultimate source of all plant improvements, are sudden, unforeseen changes that occur in the hereditary make-up. The changes, which happen irregularly and not very often, leave the plant with a new heredity, which will be shown in a change in the plant itself and may be inherited by all its progeny. Gardeners should always be on the look-out for plants which differ from normal in any useful respect, as these abnormal plants may be the means of introducing whole new races of improved plants. Spencer sweet peas and Russell lupins provide good examples of observant gardeners' taking advantage of "sports" and perpetuating them for the benefit of horticulture.

Hybridising is the remixing of existing characters in new combinations by breeding together two different plants. That introduces fascinating possibilities, but there are many teasing difficulties in the way of the hybridiser. Two varieties of the same flower can usually be bred together, but plants more distantly related, such as two species (in the same genus), may not set seeds if cross-fertilised (that is, if pollen is taken from one and put on the female stigma of the other), and even if some seed does form, it often produces abnormal and sterile plants. Crosses between plants in different genera are even more difficult to make successfully.

Despite these and other difficulties, hybridising can be a fascinating hobby, and the possibilities of entirely-new combinations are increased each time a plant collector sends home from abroad some new find bearing a new set of hereditary characters. Gardeners have already made many improvements on old varieties by cross-breeding, but there are still endless new possibilities.

Multiplying a New Variety

When a new plant has been produced, either by mutation or by hybridising, the next step is to multiply it so that it can be made available to others. That can be done either by sowing seed or by increasing it vegetatively (by cuttings, grafting, budding, division, etc.). If the plant can be multiplied vegetatively, a stock of it can be built up at once with confidence, as every plant propagated vegetatively from the original one will reproduce its characters exactly. (This is the meaning of a clonal race.)

Many plants, especially annuals, cannot be propagated in this way, but must be raised from seed, in which case the new character must first be "fixed," so that plants all come true from seed, before the new variety can be released for sale. Fortunately many garden plants can be raised vegetatively, as fixing a new variety is sometimes slow and troublesome.

Hybridising requires a knowledge of the principles of pollination, emasculation, and protection of the parent which will bear the seed, and a skilled interpretation of results if it is to produce the maximum results. Gardeners who wish to take up plant breeding as a serious hobby should acquire a copy of "Practical Plant Breeding," by W. J. C. Lawrence (London, George Allen and Unwin, Ltd., about 9s.). Time spent in a careful study of this well-written book will be more than repaid by the saving of wasted efforts, explaining failures which might otherwise dishearten the breeder and preventing him from striving after some impossibility. Though heredity depends to some extent on chance, an understanding of its principles greatly increases the odds in favour of success in a breeding programme.

Targets for Breeders

What, then, should be the aims of the plant breeder? Enthusiasts who have specialised in gladioli, tulips, or any other flower will probably be aware of some desirable improvement in their favourite flower, but a few suggestions are made for others who have no special preference for the subject of their work.

For instance, geraniums are among the brightest, freest-flowering perennials for New Zealand gardens in all but the coldest districts, but the best varieties are marred each year by the ugly spotting of geranium leaf rust. Yet some, though not the best types, seem immune to this disease. It should be possible to breed fine, sturdy, free-flowering varieties of geraniums which are immune to rust, and the breeder who did so would earn a great debt of gratitude from generations of New Zealand gardeners.

Again, the hybrid wallflower is one of the few plants that will flower all the year round in the milder districts. By recombining the characters of true wallflowers and a species of erysimum, and selecting from the progeny those which flower most freely in New Zealand, another fine garden plant could be introduced to swell the list of New Zealand-raised innovations, which is all too short except in the case of a few subjects like gladioli, rhododendrons, and narcissi.

Freesia Burtonii, an outstanding plant of Dominion origin, represents a great improvement over other freesias. Equally great improvements could no doubt be made in lachenalias, ixias, sparaxis, babianas, and the many other bulbous plants that have hardly been considered so far by plant breeders.

The list could be extended indefinitely to include improvements in size and number of flowers, new and better fadeless colours, earlier or later flowering, longer and stronger stems,

Plants Recommended by District Councils of the Royal New Zealand Institute of Horticulture for Planting in the Manawatu

Evergreen Native Trees

Kowhai (*Sophora* (*Edwardsia*) *tetraptera*)
Pittosporum eugenioides variegata
Putaputawheta (*Carpodetus serratus*)
Purple-leaved ake ake (*Dodonaea viscosa purpurea*)

Exotic Flowering Shrubs

Camellia sasanqua Hiryu
Camellia japonica Spencer's Pink
Rhododendron fragrantissimum
Rhododendron Pink Pearl
Forsythia intermedia spectabilis
Viburnum x Burkwoodii
Chimonanthus fragrans
Erica melanthera
Cydonia japonica Alarm
Daphne odora (*indica*)
Calico bush (*Kalmia latifolia*)

Deciduous Exotic Trees

Chinese yulan or lily tree (*Magnolia denudata* (*conspicua*))
Japanese apricot (*Prunus mume* The Geisha)
Flowering cherry (*Prunus serrulata* J. H. Veitch)
Flowering crab (*Pyrus malus eleyi*)
Red horse-chestnut (*Aesculus carnea*)

Native Shrubs

Pink manuka (*Leptospermum scoparium Keatleyi*)
Red kaka beak (*Clianthus puniceus*)
Hebe (*Veronica*) *speciosa*
Senecio Greyii
Olearia macrodonta
Golden tainui (*Pomaderris elliptica*)

Evergreen Exotic Trees

Magnolia grandiflora
Cootamundra wattle (*Acacia Baileyana*)
Cornus capitata (*Benthamia fragifera*)
Azara microphylla
Euonymus pendulus

Flowering Bulbs

Lilium regale
Freesia Burtonii
Narcissus King Alfred, Soleil d'Or, and Harbinger
Nerine fothergillii major
Crown imperial (*Fritillaria imperialis*)

Annuals for the Flower Border

Petunia Delight
Phlox Drummondii grandiflora
Zinnia, giant dahlia-flowered
French marigold (Tagetes) Legion of Honour
Pansy Fire Beacon

Herbaceous Plants for the Flower Border

Bleeding heart (*Dicentra* (*Dielytra*) *spectabilis*)
Calceolaria amplexicaulis
Perennial scabious (*Scabiosa caucasica*)
Gypsophila paniculata Bristol Fairy
Pulmonaria angustifolia
Pentstemon Van Hahn
Dahlia variabilis Bishop of Llandaff
Phlox paniculata Schlageter and A. E. Amos
Aster frikartii
Limonium (*Statice*) *Dickensonii*

Plants for the Rock Garden

Campanula garganica W. H. Payne
Androsace lanuginosa
Lithospermum prostratum
Cyclamen neapolitanum
Romulea bulbocodium

SMARTENING UP FRONTAGES FOR THE ROYAL VISIT

BANKS covered with long, matted grass look most untidy. They should be cut with a reap hook and the old grass put on the compost heap. If the bank is very rough, it pays to grade it, sow it with grass seed, and then keep it mown with a machine if it is not too steep. Hedges should be trimmed neatly. The hedge shown here is escallonia, which will stand hard pruning to bring it back to shape, but coniferous plants (*Cupressus* spp., etc.) will die if cut back into bare, old wood. The best way of all of smartening up a frontage is to set out a row of flowers at the foot of the fence or hedge. The most satisfactory flowers for this purpose are pot marigolds (calendulas), geraniums, and pelargoniums. They will all stand the dry conditions that usually occur in summer at the base of a hedge, where the roots of the hedge plant take much of the moisture from the soil. It is essential to dress these outside borders with complete fertiliser and compost before planting, and annually thereafter, as the soil will usually have been much impoverished by the hedge.

For a patriotic planting, red geraniums, white alyssum, and blue lobelias make a mixture which may be old-fashioned but is hard to better for a strip of bright colours in a narrow border.

[*Photo News Ltd. photo.*

and resistance to salt winds, all characters in which plant breeding might bring about worth-while improvements. Of course, gardeners who take up the improvement of some hitherto-neglected plant will not be able to join kindred spirits in an established fancier's society, but if a National Rhododendron Society, why not a New Zealand Association of Plant Breeders? In any case, the successful breeder might some day have the even greater satisfaction of being the founder of a new society to champion the cause of some group of plants which have never before been thought worth "fancying."

Named varieties of most plants are the results of the work of plant breeders, and in growing them the gardener is enjoying the fruits of others' labours. By breeding new and even better varieties the gardener can play his part in carrying on the tradition.

If the criterion of success in life is the amount of good done to others, the plant breeder whose introductions add to the amenities of thousands of homes must rank quite high in the list.

Garden Work for September

Annuals should now be sown in the borders where they are to flower, provided the soil is in suitable condition—that is, if it can be walked on without its sticking to the boots. Fork over or hoe the top inch or two of soil to break the lumps, tread the soil firm, rake it uniform, and then sow not more than one or two seeds to the square inch. Finally cover the seeds by riddling soil over them or raking lightly, but do not bury the seeds more than six times their own depth in soil. A firm, even seed-bed is essential for good results. Good annuals for outdoor sowing include pot marigolds (several named varieties in orange and yellow), purple alyssum for edging, cornflowers, candytuft, sweet sultan, clarkias, godetias, cosmos, larkspurs, and night-scented stocks. Annuals more usually raised in boxes for planting out (bedding plants), such as *Phlox Drummondii*, French and African marigolds, zinnias, petunias, salvias, antirrhinums, lobelias, verbena (the last few are not true annuals, but are usually treated as such), coreopsis, asters, and nemesias, should now be sown in John Innes seed compost and pricked out 1½ to 2in. apart into other boxes as soon as the seedlings can be handled. Some gardeners prefer to raise almost all their flower seedlings, including the true hardy annuals, in boxes, so that sturdy plants are available to put out when all risk of frost is past and after the spring bulbs are over. There is much to be said for this system in mixed flower borders, as well-grown bedding plants are better able to compete with their neighbours than are young seedlings, which often fail when sown in small gaps in the border. Varieties like linaria, mignonette, and candytuft that do not transplant well are always better sown direct into the border.

Bedding Plants raised from seed sown earlier can now be planted out in most districts, but the tender species (such as zinnias, salvias, and petunias) should not be planted until next month if sharp frosts are still likely. Well-grown, bushy, non-flowering bedding plants, each with several short stems and dark green leaves, are the best for planting. If plants are already in flower, the flower stems should all be cut off to encourage them to bush out and make larger plants before flowering. If the first flower is left on at planting time, the plants will never be first rate and will flower for a relatively-short time. Plants which are tall and spindly and have yellow or pale green leaves are "stale" (that is, they have been growing for too long in their boxes) and should be avoided.

Begonias and gloxinias started into growth earlier should now be potted or planted up into hanging baskets or be propagated by taking off the new shoots as cuttings when they are 3 to 4in. long. These cuttings will root readily in a warm glasshouse. Achimenes planted in hanging baskets are attractive in conservatories and warm sunporches.

Bulbs which will bear next year's flowers are now being formed underground, nourished by the food which

SPRING in the FLOWER GARDEN

Above—*Magnolia campbellii* makes a splendid and most ornamental deciduous tree up to 20ft. high, handsome in both summer and winter, and a glorious sight in early spring when its large pink flowers are open. Upper left— The Cootamundra wattle *(Acacia baileyana)* makes a brave show of yellow flowers in spring each year, and the feathery blue-green foliage makes the tree attractive at all seasons. Lower left—The double-flowered peach is a welcome harbinger of spring. If peach curl was troublesome last year, flowering peach trees should be sprayed with Bordeaux mixture when buds are swelling but before they burst, and again seven to ten days later if experience has shown that one application does not give complete control. Below—Lachenalias make a fine show in early spring.

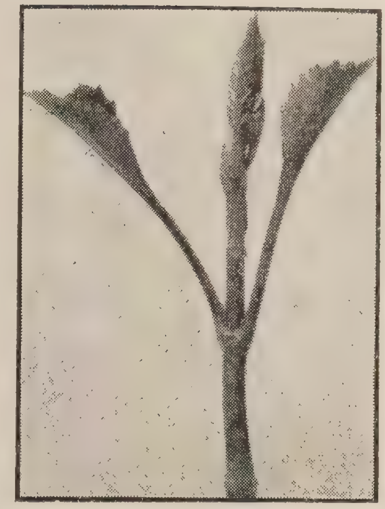
[Douglas Elliott photos.

is manufactured in the leaves and passed down to the new bulbs for storage. Though the leaves still have this important work to do, they begin to look overgrown and untidy after the flowers are over, and the gardener is tempted to cut them off for the sake of tidiness. It is wrong to cut the leaves off such plants as narcissi and hyacinths before they have begun to change colour and die down, and doing so will result in smaller bulbs than normal and perhaps fewer flowers the following year. However, where the bulbs are planted among herbaceous plants it may be necessary to reduce the bulk of leaves a little or to tuck them away below the leaves of neighbouring plants which are to flower later and might be overshadowed and killed by the mass of heavy foliage.

Chrysanthemums left in the border from last year in the colder districts should now be lifted, divided, and single rooted pieces replanted. Cuttings of late varieties propagated last month and kept shaded in a moist atmosphere should now be starting to root, as shown by the bright, fresh appearance of the youngest leaves. As soon as this sign of rooting is observed remove the shading and give the young plants drier, sunnier growing conditions to prevent them from becoming drawn or spindly. Further cuttings can be propagated from last year's stools if required. Earlier cuttings which are now well-rooted and growing strongly can be potted, putting three plants around the edge of a 4 or 5in. pot, if they are to be grown as pot plants. In mild districts well-rooted cuttings can be planted straight out into their permanent places in the borders as soon as these become vacant.

Climbing plants such as Virginian creeper, the ornamental vines, and *Solanum jasminoides* should be pruned back hard in spring, leaving a main framework of branches, but removing most of the thin, tangled, younger wood.

Dahlia roots put into boxes in frames or on to the benches of greenhouses last month should now be starting to grow. The first sign of growth is the development of buds on the necks of the tubers, near where they join the main stems of the old plants. The plants can be increased in several ways as soon as these buds can be seen clearly. The most usual system is to cut off the shoots when they are about 3in. long, either with a small piece of the tuber attached or cleanly just below the bottom pair of leaves, the latter being the better system where large numbers of cuttings are required. Insert the cuttings 1in. deep and 3in. apart in boxes or pots of light, sandy soil and put them in a frame or glasshouse to root. As soon as the cuttings have rooted they can be planted out, if there is no danger of frost, or hardened off in a frame until it is safe to plant them. Another method of propagating dahlias in warm districts where last year's roots have been left all winter in the borders is to lift the roots now and stand them in a frame, in a sheltered, sunny place outside, or on a warm windowsill until buds develop on the tuber necks; then divide the roots and pot each piece or replant it in the border, making sure that each tuber bears at least one healthy bud.



A dahlia cutting prepared by the removal of the two lower leaves and the cutting off of the stem cleanly just below where the leaves joined it.

Fuchsias should be pruned hard in spring to encourage plenty of new flowering shoots to grow. Cut out thin, weak, and dead shoots altogether and cut healthy shoots back to 6 to 12in. from their bases, leaving the strongest ones longest.

Geraniums and pelargoniums are fine garden plants which will flower all through the driest summers. They can be planted now in mild districts, but all risk of frost should be past before they are planted elsewhere. Plant them firmly in the sunniest position available.

Gladiolus planting is an important job for September, when the health of the season's flowers will depend largely on the care with which the corms are prepared for planting. As they are taken from store each corm should be "husked" (the outer skin removed) and looked over for diseased places; these should be cut out with a sharp knife if small, but it is better to burn corms that have bad scars or scabs. After the corms have been inspected and sorted in this way all those suitable for planting should be treated in a mercury dip just before being planted to kill any disease infection which still persists on the corms. A suitable dip can be made up by a chemist (as described on page 305 in the September, 1947, "Journal") or a proprietary mercuric preparation can be used. In either case corms should be dipped in a glass or wooden container and proper safety precautions observed, as these dips are extremely poisonous. Leave the corms in the solution for 1 to 2 hours, allow them to dry, and plant them at once. The solution may be used for more than one batch if topped up each time, but should be discarded at the end of each day and more often if it becomes very dirty, as dirt destroys the active ingredient. Though husking the corms is necessary to inspect them, American work has shown that husking makes corms more susceptible than usual to disease if planted in contaminated soil. Therefore it is very risky to plant husked corms in soil where a crop was diseased in the previous season. Plant corms 6 to 8in. apart and up to 6in. deep in light, well-drained soil, but only 2 to 3in. deep in heavier or shallow soil.

Herbaceous plants that are sending up a thicket of new shoots should be thinned out by removing all but two or three to each plant; the few which are left will produce a much finer display of flowers. If the planting of any more herbaceous perennials is planned, they should be obtained and planted at once or they will not produce many flowers this season. In later districts there is still time to lift delphiniums and lupin stools when the new shoots first show, divide the roots, and replant the pieces on which shoots are growing.

Hydrangeas should now be pruned in the colder districts where hard winter frosts make autumn pruning inadvisable. The method is to cut out as far as possible all shoots which flowered last year. New shoots should be left unpruned, as this season's flower buds are borne at the ends of the shoots and will be removed if the shoots are shortened. The late, unsatisfactory flowering of many hydrangea bushes is caused by incorrect pruning.

Iris tingitana grows well enough in New Zealand, but it flowers very erratically for reasons not yet fully understood. At one time it was thought to be the result of the difference in length of day between places in the Northern Hemisphere where it succeeds and in New Zealand; but that is not so, as *I. tingitana* comes from the coastal countries of the Mediterranean, which have about the same latitude as New Zealand. It has also been suggested that the plant would flower better if grown in ground baked hard by the sun in summer. There may be some truth in that, as summer conditions in parts of Spain and Algeria, where it thrives, are probably drier than in much of New Zealand. But that cannot be the full explanation, as the iris flowers well in parts of England where the summer rainfall is appreciable. New Zealand gardening literature generally recommends that the iris should be grown in a dry, sunny position where the ground dries out thoroughly in the summer. Moreover, lifting the bulbs after the foliage dies down and putting them out in a sunny place in boxes to be sun dried is said to encourage flowering. Bulbs should not be planted too deeply, and they prefer a soil the surface layer of which soon dries after rain. A note was recently received from Holland to the effect that *I. tingitana* bulbs grown in the south of France are forced into early flowering in Holland by the following treatment: Bulbs are lifted as early as possible and sent to Holland, where they are stored for about three weeks at 28 degrees C., then planted in boxes of sand and subjected to a low temperature of 5 degrees C. until about an inch of foliage is showing

WORK IN THE FLOWER GARDEN . . .

above ground; they are then taken into a glasshouse and kept at 13 degrees C. until the shoot is 2in. long, and finally kept at 17 degrees C. until they flower. Although this treatment is designed to hasten flowering, it would be interesting to know whether it would increase the proportion of flowers produced under New Zealand conditions. The Dutch iris variety Wedgewood flowers so much more regularly than *I. tingitana*, to which it is closely related, that it can be considered more satisfactory as a garden plant.

Lawns should be given their quarterly dressing of fertiliser, the ingredients of which were given in the May "Journal." The purpose of this dressing, the ingredients of which have been carefully chosen after prolonged trials of other fertilisers and mixtures, is to feed the grass and yet discourage the growth of weeds and clovers. Not only does the mixture discourage weed growth by altering the character of the soil, but it also has a burning effect on the leaves of flat (rosette) weeds. The burning is most effective when the mixture is applied dry, preferably when there is dew on the ground. The regular use of the mixture will bring about a gradual but very remarkable improvement of lawns in most districts. Bare places on lawns can still be sown in cool districts, but spring sowing of lawns is not usually satisfactory in districts which have warm, dry summer weather, as the ground is likely to dry out before the grasses are able to become established.

Planting out is another of September's most important jobs. In the warmer districts bedding plants can be planted out from boxes, but elsewhere it is better to harden off the young plants thoroughly and delay planting for a few more weeks. Young herbaceous plants (such as delphiniums, lupins, and antirrhinums) raised from cuttings taken earlier should also be planted out, as should rooted marguerites and carnations from winter-struck cuttings, and plants such as gaillardias and oriental poppies raised from root cuttings. Violas which have been raised in frames should also be planted now. In warmer districts young geraniums, balsams, and lobelias can be put out from the frame after being hardened off, but that should be delayed in places still liable to frost. In all cases the bed should be dressed with complete flower border fertiliser (described in last April's "Journal") before being planted if this dressing has not been applied already.

"Pricking out" is a necessary stage in the process of raising flower seedlings in boxes (bedding plants). By transplanting the seedlings it can be ensured that each one will have the right amount of space in which to develop and that the plants will all be well developed, sturdy, and uniform. Seedlings should always be pricked out as soon as they can be handled, preferably when the main root is not more than ¾in. long and while only the seed leaves are showing. Though handling such young plants is tedious work, they will recover more quickly and make better plants than if pricked out when they are larger.

[*Douglas Elliott photo.*

Magnolia soulangiana is one of the finest hybrid magnolias, bearing a profusion of purple flowers in late winter, when there is often a dearth of colour in the garden.

Pot plants, such as kentias, maidenhair ferns, asparagus "fern," and geraniums, growing in the house should be repotted in spring each year. Turn each carefully out of its pot, remove the piece of broken pot from the bottom of the ball of soil, and gently tease away as much of the old soil as possible without injuring the roots. Then repot the plant into a clean pot the same size as, or only slightly larger than, the one from which it was taken, using the John Innes potting compost described in the July, 1947, issue of the "Journal." Pot firmly, working the soil well between the roots of the plant to avoid leaving cavities in the soil, and do not overfill the pot, but leave sufficient room—say ½in.—at the top for watering. After potting carefully trim off any dead, damaged, or dying leaves and wipe the remainder clean with a damp cloth in the case of palms. Geraniums should be pruned back hard to within a few inches of the bases of each branch to keep the plants short and sturdy. As newly-potted plants have few feeding roots they require very little water at first. If the compost was in correct potting condition, no water need be given for several days. Pots should always be thoroughly clean, inside and outside, when used for potting. If the old pot is to be used again, the plant should be turned out, set aside, and covered with damp newspaper to prevent the roots from drying while the pot is scrubbed clean, and then allowed to dry before being used again.

Seed sowing is the most important job in the flower garden in September in most districts. Sow hardy annuals outdoors and others in boxes, as described, especially if no glasshouse is available. Seedlings raised in frames or sunny windows grow more slowly than those in heated glasshouses, but should not necessarily be sown earlier. There is no point in sowing seeds of any sort until growing conditions are suitable for them. By sowing flower seeds at intervals in small batches a succession of bedding plants can be produced for planting out as space becomes available. That is better than having a large batch of seedlings all ready to be planted out at the same time, when there may be nowhere to put them. Bedding plants will deteriorate rapidly if not set out just when they are ready.

Silt soils are not easy to sterilise, because such soil "runs" together into a solid mass through which heat and steam penetrate slowly. Hence the importance of choosing loam which contains a proportion of silt, but also sufficient clay and sand to keep it open while it is being sterilised. There are plenty of good loamy soils in New Zealand, but some of the soil is silty. Home gardeners who find that their soil "runs" when being steamed should try baking it instead, as described last month, as correct baking does not cause serious deterioration of its texture.

Spanish broom (*Spartium junceum*) is a fine shrub, with sweet-scented, golden-yellow flowers that are borne freely all through summer and autumn when colour is most needed in the garden. Brooms transplant poorly and are best raised from seeds, sown now in pots, and planted out in the autumn. To prevent the bushes from becoming overgrown and straggling, with bare lower branches, prune them this month by cutting back last season's growths to within a few inches of the previous year's wood.

"Spring gardens" should now be at their best. Many New Zealand gardens are a blaze of colour from August to November, but fall off badly through the dry, hot summer months. One of the common reasons is that the soil is lacking in the humus needed to make it hold moisture, yet most home gardeners could keep up the humus content of their soil by properly composting every scrap of organic waste from both kitchen and garden. Another too-common reason for the flower border's tailing off is neglect to pick off faded flower heads.

A quarter-acre section with average-sized flower borders should now be producing seven or eight buckets of dead flower heads a week, all useful in building up the next compost heap that will in turn provide the humus needed to keep plants flowering through the summer.

Sweet pea seeds can be sown outdoors, where they are to flower, in most districts to give a late display, but in very cold places seed should be sown in a box in a frame and the seedlings planted out next month. Elsewhere sweet peas which are growing strongly and are to be grown as cordons for exhibition should be trained by removing all tendrils and side shoots and tying the stems to some form of support.

Weeds grow quickly in the spring as the soil warms up. September is a "weeding month," when a determined effort should be made to clean up the garden.

Thin out **annuals** in the borders, first to an inch or two apart, then to 8 or 9in. apart, or more for tall-growing varieties.

Cuttings can be taken of **antirrhinums, marguerites, hybrid wallflowers,** and *Agathea coelestis*, all of which will root readily in cold frames, especially if treated with one of the proprietary rooting hormones.

Catmint borders should be cut back hard to encourage new growth.

Apply the **complete flower border fertiliser** over the whole of the borders if this has not already been done.

Prune **fuchsias** in early districts.

Cut dead and dying leaves off *Iris stylosa.*

Long stems of **jasmine,** cut in bud and the leaves removed, make splendid sprays for use as cut flowers in the house, where the buds will open.

Sow seeds of **polyanthus, primroses,** and other primulas in boxes to provide plants for autumn planting.

Plants of *Primula malacoides* and other primulas can be lifted from the border even when in full flower, potted, and taken into the house, where they will make a welcome display for a week or two as pot plants.

Layer **rhododendrons** and **magnolias** where new plants are wanted and there is a branch which can be taken down to the ground.

[*Douglas Elliott photo.*

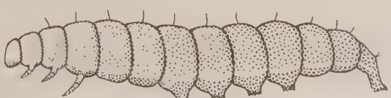
Protea cynaroides is an unusual member of the *Protea* family that revels in a hot, dry situation.

Rose pruning should now have been completed everywhere.

Take cuttings of **violets** and root them in a frame or cool, shady place.

Reminders About Common Troubles

Leaf-rolling caterpillars are among the most troublesome pests of ornamental plants. The caterpillars, which are those of various species of tortrix moths, feed on the leaves, but often draw together two leaves, or roll one over and fasten the edges together with silken threads, to protect themselves against observation and attack by their natural enemies. Leaf rollers, which can be found at almost any time of the year, vary from green to yellowish-brown in colour, are up to 1in. long when fully grown, and are hairy with brown, shining heads. They wriggle violently backward when disturbed, especially if touched at the head end, and are often seen hanging from leaves, tail downward, suspended by a silken thread. The caterpillars do not "loop," but wriggle along. The commonest and most troublesome species is the Australian leaf roller. The moths of all the species are small, dull looking, and not in any way conspicuous, but can often be seen sheltering underneath leaves. They lay their eggs on the leaves, usually in masses, but the young larvae disperse by letting themselves down on threads, on which they are carried about in the wind.



Among the many plants on which leaf-rolling caterpillars feed are boronia, lupin, cypress, citrus, cabbage tree, pelargonium, pine, pear, oak, rose, blackberry, raspberry, grape, camellia, gum, manuka, ngaio, spruce, matipo, honeysuckle, apple, dock, plum, fuchsia, maple, broom, holly, myrtle, and chrysanthemum. Because of their feeding habits, they are not always easy to control, but gardeners should keep a sharp lookout for the first sign of attack. When this is noticed, use of a lead arsenic (poisonous) or D.D.T. spray should kill most of the caterpillars, and any that are not killed by the spray can usually be killed by hand.

Subterranean grass caterpillars are changing to adult moths at this season of the year. The shiny brown chrysalids wriggle to the surface, where the moth emerges and flies away, leaving the empty chrysalid case lying on the surface or perched half in and half out of the burrow. The chrysalid cases, often seen on lawns in spring, may puzzle gardeners.

A DAY'S MENU WHICH PROVIDES ALL THE NUTRIENTS REQUIRED FOR HEALTH

BREAKFAST

PORRIDGE, MILK, AND GOLDEN SYRUP

MINCE, PARSLEY WHEELS, AND TOMATOES

TOAST, BUTTER, HONEY

COFFEE

DINNER

GRILLED CHOPS AND BOILED POTATOES, CARROTS, PEAS

PRESERVED OR STEWED FRUIT AND JUNKET

FRESH FRUIT

LUNCH OR TEA

LETTUCE, CHEESE, CELERY, AND POTATO SALAD

WHOLEMEAL BREAD, BUTTER, JAM, CHEESE, SCONES

TEA

Food Requirements for Health

By EVELYN E. MOORE,
Rural Sociologist, Auckland.

THE need for a well-balanced menu and the foodstuffs it is necessary to include in such a menu were discussed in the previous article in this series, "Food Planning for Health." These basic principles of diet are not hard to understand and are very quickly learnt. In fact, their use in the selection of food and the preparation of meals can become just as much a habit as the rules of cleanliness and personal hygiene learnt in childhood.

[National Publicity Studios photo.

Health is not merely absence of disease, but rather a positive quality of life that can be built up by imperceptible degrees to successively-higher levels.

THE amounts of these foodstuffs which should be eaten daily have, however, been a controversial matter, and even today the National Research Council of America states that its recommended allowances are not to be regarded as final, though it seems probable that any alterations will be of a minor nature. In addition, especially if there are economic factors and food shortages to be considered in diet planning, it is necessary to distinguish between the amounts required for the best possible nutrition and the level of food consumption which will maintain normal health and preclude the development of deficiency diseases.

The difficulties which arise in the determination of these standards will be appreciated when it is realised that even the distinction between normal and subnormal nutrition will fall at different levels, depending on the diagnostic method and the skill with which it is used, and that health is not merely the absence of disease, but rather a positive quality of life that can be built up by imperceptible degrees to successively-higher levels.

Each nutrient or essential food constituent has to be studied separately to determine the amount above the disease-preventive level which will produce optimum health. With some nutrients the two levels may almost coincide; with others an improvement in the health, size, or longevity of animals can still be detected when the consumption is two or three times the minimum required to prevent disease.

It is this fact which has led some authorities to recommend the inclusion in the diet of what under most circumstances would seem to be unduly-large quantities of some foodstuffs. Whether the human being actually benefits from the extra amounts of these foods has yet to be finally established, though even if they are shown to be advantageous, it is unlikely that the effect will be so marked as to warrant their consumption by people to whom they have no appeal.

Body's Requirements of Nutrients

The important fact that there are some foods without which it is extremely difficult to provide a balanced diet has, however, been accepted by all leading dietary authorities. Chief among these protective foods are milk, vegetables, and fruit, and it is the task of the nutritionist to determine the amounts of each required daily to maintain health. Some of them had been recognised as valuable cures for certain diseases for centuries; others, such as milk and eggs, were always an important part of the convalescent diet, but the fact that the absence of a sufficiency of these protective foods from the diet may in the first place have caused the disease was never realised.

Until it was discovered during the nineteenth century that bacteria could produce many diseases physicians were, reasonably enough, more concerned with cures than causes, and later they assumed that all otherwise-unexplainable diseases must be due to these bacteria. It was not until the science of chemistry had advanced sufficiently to enable chemists to separate foods into their major constituents—carbohydrates, proteins, fat, and ash or mineral matter—and to feed these pure substances to animals that their relative importance in the diet could be investigated.

It was soon evident that not only all these nutrients, but also certain factors which were called vitamins and which were present in the extracts of grains, yeast, fruits, and some fats, such as butter, were required to keep the animals alive and well. Some of them were not essential for all animals; for example only guinea pigs, apes, and human beings require the extract of fresh fruit and vegetables called vitamin C, and it seems possible now that man may not require all the B vitamins which have been shown to be essential for the normal nutrition of rats.

As soon as most of these substances were isolated from foods and reliable methods of estimation were developed scientists were able to find the amount of each required daily, and therefore the value of the different foodstuffs as sources of these nutrients.

Effect on National Health Plans

The availability of accurate information on the value of food and the economy of food production has been particularly useful to the allied nations during the war and the serious food shortages which have occurred since then. While the insufficient quantity of food available has always been their chief concern, they have been able to alleviate this shortage to some extent by increasing the production and importation of those foods which supply a maximum number of calories per acre, such as wheat and potatoes; by using unrefined or incompletely-refined cereals which retain their maximum food value; by encouraging vegetable production, and by making available special allowances of protective foods, such as oranges, milk, and eggs, for those people who need them most.

Consequently, while the variety of foods available in Britain, for example, has been seriously curtailed, resulting in the monotonous and yet nutritionally-adequate though not optimum diet so distasteful to the people, there has not been the increase in sickness and ill health which less-well-planned austerity rations have caused in similar crises throughout the centuries.

Other Practical Applications of Recommended Allowances of Nutrients

It may be wondered why it is necessary to bring technical expressions such as calories and vitamins into any discussion about food requirements, or indeed why the requirements may not be expressed simply in terms such as so many ounces of green vegetables each day. At least

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Photographs on opposite page by Sparrow Industrial Pictures Ltd

MENU BASED ON AVERAGE NEW ZEALAND FOOD CONSUMPTION FIGURES FOR 1945

(It does not contain sufficient milk, green vegetables, fruit, or wholemeal bread.)

BREAKFAST

PREPARED CEREAL AND MILK

SAUSAGES AND FRIED BREAD

TOAST, MARMALADE, BUTTER

TEA

DINNER

CORNED BEEF, POTATOES, CAULIFLOWER, AND ONION SAUCE

APPLE PIE

TEA

LUNCH OR TEA

SOUP

WHITE BREAD, BUTTER, JAM

SCONES

CAKE

TEA

FOOD REQUIREMENTS FOR HEALTH

The accumulation by international nutritionists of accurate information on the value of food and the economy of food production has led to concentration on foods which supply the maximum number of calories per acre, and encouragement of vegetable production has been one of the main lines of attacking food shortages problems since the war.

one important use for these expressions is that they make possible the formation of tables of food requirements which will have the same meaning in any country. This is necessary because not only do different varieties of foods vary greatly in their chemical compositions, but similar varieties grown in different climates and under different conditions may also vary considerably.

Food habits of different nationalities are also quite dissimilar, so that a list of foods for a healthful diet for New Zealanders may be quite unsuitable for some other country, either because some of them are unavailable or generally unpopular. Dietitians in any country, however, once they have a table of the composition of the foodstuffs commonly eaten, can find out the amounts of the nutrients in an average diet and measure the diet's adequacy against the international standard.

Until this century it was chiefly a matter of opinion which foods were good and nourishing and which were indigestible or harmful. The choice of food was and in fact still is governed mainly by convenience, tradition, and individual tastes. Some of the first attempts to set a standard of food requirements were instigated by Governments and institutions anxious to know the minimum amount of food necessary to keep the people alive and sufficiently healthy to be able to work. At that time it was thought that the nutritional needs of any animal species could be determined with due reference to age, size, and activity, and expressed as so much pure fat, carbohydrate (starches and sugars), and protein.

This led nutrition workers of that time to recommend a diet with a high proportion of carbohydrates and composed chiefly of grains and potatoes, the most economical sources of energy available, as a basis for calculating a country's food requirements. Refined cereals and sugars were also advocated, as these cost no more to produce with efficient machinery, the by-products could be used for stock feed, and the refined food was a better source of energy than an equivalent weight of the whole grain.

Later recommendations included foods containing mineral salts, and as the vitamins were discovered, alterations were made when necessary, until the present standards, whose aim is "to furnish guidance for the nourishment of the body at desirable levels," were developed. These recommendations give the number of calories and the amounts of all the nutrients which have been established as necessary for normal health; the amounts of some other nutrients which are likely to be deficient only under special circumstances, such as iodine in goitrous areas, have not yet been established.

A chart of the foods which should be included in the diet every day accompanied the previous article in this series. On this page and in the illustrations are suggestions of ways in which adequate amounts of each may be incorporated in the menu to fulfil the requirements of an optimum diet for normal adults. (An average New Zealand diet prepared from figures obtained in the latest New Zealand Official Year-Book is included for comparison.) In later articles the amounts of foodstuffs which will supply an optimum amount of each of the nutrients will be considered more fully.

Simple Menu Providing All the Nutrients for Health as Recommended by the National Research Council of America

BREAKFAST

Porridge, milk, and golden syrup
Mince, parsley wheels, and tomatoes
Toast, butter, honey
Coffee

DINNER

Grilled chops and boiled potatoes, carrots, peas
Preserved or stewed fruit and junket
Fresh fruit

LUNCH OR TEA

Lettuce, cheese, celery, and potato salad
Wholemeal bread, butter, jam, cheese, scones
Tea

Note: Morning and afternoon teas and supper may be included if desired. A milk drink and sandwiches are preferable to tea and cakes, though tea and cakes may be served occasionally.

Menu Based on the Average New Zealand Food Consumption Figures from the New Zealand Official Year-Book, 1945

BREAKFAST

Prepared cereal and milk
Sausages and fried bread
Toast, marmalade, butter
Tea

DINNER

Corned beef, potatoes, cauliflower, and onion sauce
Apple pie
Tea

LUNCH OR TEA

Soup
White bread, butter, jam
Scones
Cake
Tea

This diet contains less vitamin C and vitamin A than the National Research Council recommends, and barely sufficient vitamin B or thiamine. If it had more fruit and vegetables and more wholemeal bread or porridge instead of white bread, and, most important, at least a pint of milk each day, this diet would be greatly improved and would readily satisfy the council's recommendations.

Photographs on opposite page by Sparrow Industrial Pictures Ltd.

An Early Southern Settlement

WHEN John Howell, English captain of the schooner Eliza, was commissioned in 1836 to establish a whaling station at Jacob's River (now known as the Aparima) his undertaking resulted in the founding of Riverton. Captain Howell was an outstanding whaler of his day, and the ship's medicine chest, which accompanied him on many of his trips, is now a treasured relic in the Southland Museum. Of polished mahogany and bearing a tiny brass plate engraved with the schooner's name, this chest is a fine example of nineteenth century craftsmanship; each of the 26 bottles has its individual compartment, and the bottom tier is arranged in a neat little tray which pulls out like a drawer. Most of the bottles have square-cut stoppers of bevelled glass, but a few have corks labelled by an early Invercargill chemist. They contain such old-fashioned remedies as essence of peppermint, lavender drops, milk of sulphur, camphor, calcined magnesia, rhubarb, essence of ginger, soap liniment, sal volatile, and antimonial wine. There are also a glass mortar and pestle and two round, ivory boxes, one for blue pills and the other for calomel. Several small saffron-hued pellets still remain in the second box, all that are left of its original contents.

As the newly-formed settlement sorely needed a blacksmith, Captain Howell, while on a visit to Sydney, persuaded John Bragg, of Massachusetts, who had just arrived off an American whaler, to set up in this occupation at Riverton. The young American perferred Stewart Island as his permanent abode, however, but visited Riverton from time to time to do work for Captain Howell. Parakimate, as the Maoris called John Bragg, married the beautiful Ewha, who lived with her aunt at Ruapuke, an island midway between Bluff and Stewart Island and stronghold of the principal South Island chiefs. The wedding took place on January 29, 1851, at the home of John Williams, Halfmoon Bay, the necessary particulars being set forth on a flimsy sheet of paper in the neat script of the officiating minister, Bishop Selwyn. This fragile document certifying his grandfather's marriage is greatly prized by its present owner, Mr. Thomas Bragg, of Halfmoon Bay. Mr. Bragg also has in his possession a local marriage register which was first used nearly 100 years ago, when James Lee of Paterson Inlet wedded Ann Lidiard, aged 15, the daughter of John Clark Lidiard, of Jacob's River. From the frequency with which the names of 15-year-old brides occurred in the records it was evident that it was quite the fashion then for girls to enter into wedlock at that tender age. Indeed, one young lady had been married, widowed, and acquired a second husband by the time she was 18! The two most striking instances of disparity in ages were those where two bridegrooms of 37 and 48 respectively espoused maidens in their very early teens. Some of the applicants were apparently uncertain as to their exact date of birth and gave their ages as "about 23" or "about 28," and an elderly Maori couple candidly stated "old man" and "old woman." Those who could not write made a cross for their mark.

[*National Publicity Studios photo.*

Halfmoon Bay, Stewart Island, home of Thomas Bragg.

The register of deaths, too, made interesting reading. The cause of one man's death was diagnosed as "perhaps jaundice." Drowning accidents were a common occurrence, and there was a detailed account of a dual tragedy when a boat capsized and a Maori and a European were drowned; "the latter was washed on shore." Fever accounted for many deaths among adults, and "consumtion" likewise claimed a number of victims, the comment concerning one youthful consumptive being: "She was a meek and pious girl." Nevertheless, the Church could be stern in its disapproval of those who forsook their Christian beliefs, as was shown by its judgment on the woman Victoria who died of "nerveous fever and was buried without Divine Service because of having employed a Sorceres to recover from her illness." A similar ban on Christian burial extended to another poor soul because she hanged herself in fretting over the loss of her child. Measles seemed to be the most prevalent cause of infant mortality in those days, with influenza a close second.

The person responsible for entering all these records was the Rev. J. F. H. Wohlers, the first missionary for Foveaux Strait. The younger son of a Lutheran farmer, he was well qualified practically as well as theologically for his arduous vocation. Although he was a fully-accredited representative of the North German Missionary Society, he received no stipend, depending entirely on his own agricultural efforts for sustenance. His decision to set up a mission station at Ruapuke was greeted with great joy by the Maoris, and few ministers have been more beloved than this simple, godly man, who served his Maker "as much with the spade and plough as before the altar." When visiting his friend the Rev. Watkin at Waikouaiti he met a young widow, Mrs. Eliza Palmer, of Wellington, who was acting as a companion to Mrs. Watkin. Her sojourn in the Watkin household was short lived, however, for now there was another aspirant to her company. John Wohlers's wooing was evidently as eloquent as his preaching, and the sweet-faced Eliza consented to become his wife. The Maoris called her "mata porora" (mother), and while her husband instructed the natives in European methods of soil cultivation and attended to the children's schooling she undertook to improve domestic standards.

The Wohlers had one child, a fair-haired daughter with eyes the colour of the sea. Among the entries in the baptismal register for 1876 her name is inscribed as godmother to Thomas Bragg, grandson of John Bragg, his godfather being his mother's youngest brother. Gretchen Wohlers married Arthur W. Traill, who had originally come to New Zealand as second mate on a ship and later became the resident catechist at The Neck, the large isle at the entrance to Paterson Inlet. Although small in stature, she had inherited to the full her parents' remarkable capacity for activity, and not only did she bring up a big family (seven sons and one daughter), but she helped her husband when he was appointed to be the first schoolmaster at The Neck; her godchild was educated at this school.

Mr. Bragg also remembers Mr. Charles Traill, the schoolmaster's brother. This noted botanist and conchologist lived on the island of Ulva, further up the inlet, an ideal spot for the furtherance of his scientific studies. Thomas Kirk, F.L.S., Chief Conservator of State Forests, in his book "The Forest Flora of New Zealand," published in 1889, acknowledged his indebtedness to Mr. Traill for plant names used by the Stewart Island Maoris, and named a rare species of olearia in his honour. Mr. Bragg has a fine specimen of this daisy tree with its handsome bluish-purple-centred flowers growing in his garden.

The outlying islands are almost deserted today, save for lovely Ulva, which is now a scenic reserve and sanctuary for birds, the ranger, fittingly enough, being one of Gretchen Traill's sons; but Thomas Bragg's stories of these southern shores his forbears loved still form a strong, intangible link between the prosaic present and the romantic past.

Mary

SAUCES Sweet and Savoury

[*Sparrow Industrial Pictures Ltd. photo.*

Hard sauce can be served in a dish and used to garnish baked or steamed puddings.

THE serving of appropriate and tasty sauces to accompany the main dishes is an essential part of a formal meal and will add interest to everyday cookery. In this way the family can be introduced to new flavours, and plain food can be made much more exciting. This article by Norma K. Metson, Rural Sociologist, Wellington, describes how to make a basic sauce and its variations, and gives recipes for several kinds of sauces for use with meats, vegetables, and puddings.

AS sauces usually require time and attention in the rush period just before the meal is served, the housewife who works alone may not be able to make them as often as she would like. To overcome this difficulty some sauces can be prepared in advance and kept hot or reheated, or time saved by preparing simple dishes can be used later to "dress them up" with a new sauce.

The liquid, the thickening, and the flavouring make up the sauce; the liquid may be water, milk, or stock; the thickening cornflour or a similar starch, flour, or egg; and the flavouring anything from onions to molasses, depending on the taste of the cook and the purpose for which the sauce is to be used. Recipes for special sauces list the ingredients necessary to give them their distinctive characteristics, but amounts of seasonings such as salt, pepper, spices, and herbs may be varied to suit the family.

General Rules

Here are some general rules to be followed in the making of sauces:—

1. When flour or cornflour is used as thickening, the sauce should be cooked for a few minutes after it has come to the boil. That prevents the raw taste which occurs if the starch is not properly cooked.

2. If eggs are the main thickening agent, as in a custard sauce, the mixture must not be allowed to boil; it will thicken just before boiling point is reached. Cooking over water in a double boiler will ensure that the sauce does not boil and lose its smooth texture.

3. If the recipe requires both eggs and a starchy thickening, it is usual to cook the starch mixture first, then remove it from the stove and allow it to cool slightly before adding the beaten egg. A sauce with a light and fluffy texture will result if the yolk and white of the egg are beaten separately and the white added last to the cool mixture.

4. A small quantity of lemon juice (½ to 1 teaspoon to one cup of sauce) improves the flavour of white sauces. It should be added after cooking is completed or the sauce may curdle.

5. To keep a sauce hot, cover the saucepan with a tightly-fitting lid and stand it in hot water.

High-class cookery books recommend that all sauces should be strained to improve the texture, but that makes extra work, and ordinarily, if care is taken in preparation to avoid lumps, straining is not necessary.

Basic Recipe

The standard recipe for white sauce requires 2 tablespoons of fat, 2 tablespoons of flour, 1 cup of milk, and salt and pepper or sugar. Melt the fat, stir in the flour, and cook them for a minute or two. Remove them from the heat, add the seasoning or sugar, and then add the milk slowly, mixing the ingredients smooth after each addition. Return the sauce to the stove and heat it until it is boiling, stirring constantly. Cook it for 3 to 5 minutes more.

The thickness and richness of the sauce may be varied by using more or less flour and fat. One tablespoon of each will give a thin sauce for use in cream soups, three tablespoons a thick one for souffles and made-up dishes.

To save time spent in watching and stirring the sauce, a small quantity of cold milk may be used to mix with the flour and fat and the remainder of the milk added hot, or the milk and fat may be heated and the flour mixed to a smooth cream with cold milk or water and added just before the liquid boils. These two methods save work, but the standard method will produce a sauce superior in texture and flavour.

Brown sauce is made similarly, but the fat is first browned, there is more cooking to brown the flour thoroughly, the liquid is usually stock or vegetable water, and the sauce is more highly seasoned.

White Sauce Variations

Here are some methods of making savoury varieties of a white sauce:—

Just before cooking is completed add to one cup of sauce 1 to 2 tablespoons of chopped parsley, 1 to 2oz. of grated cheese, 1 chopped hard-boiled egg, or 1 chopped cooked onion. Use the smaller quantity of cheese if it is tasty or if the sauce is to be used as a garnish only.

For caper sauce add the chopped capers just after the sauce has boiled and a tablespoon of vinegar when the sauce is cooked.

Fish stock or vegetable water may be used as part or all of the liquid, or the milk to be used may be seasoned in the following way: Put the required quantity of milk into a saucepan with a small piece of carrot, turnip, onion, and celery, a bay leaf, one or two cloves, and a few sprigs of parsley; heat the milk slowly, or leave it to stand on the side of the stove; strain and cool it before using it.

Recipes for Other Sauces

Bread Sauce

½ pint of milk
2oz. of breadcrumbs
½ small onion stuck with two or three cloves
Pinch of cayenne pepper
1oz. of butter
Pepper and salt

Put the milk in a saucepan, add the onion and cloves, and heat them very gently, simmering until the milk is well flavoured. Remove the onion and cloves, add the breadcrumbs, and cook the sauce slowly, stirring until the breadcrumbs swell and thicken it. Add the butter and seasoning.

Mustard Sauce

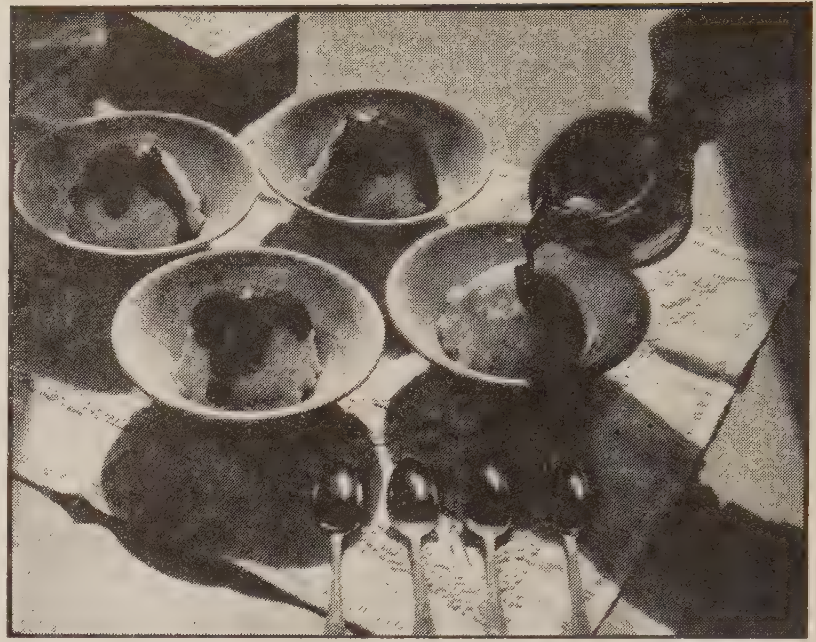
1oz. of butter
1 teaspoon of flour
1 teaspoon of dry mustard
2 teaspoons of vinegar
¼ pint of water or stock
Pinch of salt

Melt the butter in a saucepan and add the flour and mustard. Remove the saucepan from the heat and add the liquid, mixing carefully. Heat the sauce to boiling, stirring constantly, and cook it for three minutes more. Add the vinegar and salt.

Hollandaise Sauce

2oz. of butter
1 tablespoon of vinegar
2 tablespoons of water
2 yolks of eggs
1 teaspoon of lemon juice
Salt, pepper, and cayenne pepper

Put the water, vinegar, and egg yolks in the top of a double boiler over hot water and heat them, stirring constantly, until the sauce thickens. Take it from the heat and add the butter in small pieces, letting each piece melt before more is added. Add the lemon juice and seasoning. This sauce must not boil or it will curdle.



[Sparrow Industrial Pictures Ltd. photo.

Hot chocolate sauce on ice cream provides a pleasing contrast in flavour, texture, and temperature.

Chocolate Sauce

1 tablespoon of cornflour
1 dessertspoon of cocoa
½ cup of sugar
Pinch of salt
1 egg
2 tablespoons of butter
2 teaspoons of vanilla
1 cup of hot water

Mix the cornflour, sugar, cocoa, and salt. Gradually add the hot water and cook the mixture until it is thick, stirring constantly. Cool it a little, add the beaten egg yolk, and cook it for a minute or two. Add the butter and vanilla, cool the sauce, and fold in the beaten egg white.

Lemon Sauce

1 tablespoon of cornflour
Rind and juice of ½ lemon
2 tablespoons of sugar
1 cup of water
½oz. of butter

Grate the lemon rind and mix it with the sugar. Mix the cornflour smooth with a little water, add the remaining water, and heat it until it is boiling. Add the sugar and rind and cook the mixture for a few moments. Add the lemon juice and butter.

Hard Sauce

2oz. of butter
4oz. of sugar
½ teaspoon of vanilla

Castor sugar is best, but brown, icing, or ordinary sugar may be used. Soften the butter slightly and beat it until it is very light and creamy. Add the sugar gradually, beating continually until it is dissolved and the mixture is white and frothy. Add vanilla and serve the sauce piled in a glass dish.

Apple Sauce

½lb. of apples
1oz. of butter
1 tablespoon of brown sugar
¼ cup of water
Pinch of nutmeg
Pinch of salt

Peel, core, and slice the apples and put them in a saucepan with the water, sugar, salt, and nutmeg. Cook them to a pulp, stirring frequently with a wooden spoon. Add the butter and beat the sauce until it is smooth.

[Sparrow Industrial Pictures Ltd. photo.

Ingredients for the preparation of bread sauce.

Planning Meetings of Women's Organisations

SOME answers to the question "What is the value of women's organisations, and of their meeting and doing things together?" were given in an article in last month's "Journal." But those who plan the programmes for these meetings have to do more than decide the answer to "Why do we meet?" They must then go on to ask "What do we want to do together?" and "How are we going to do it?" In this article Eirene Unwin, Rural Sociologist, Dunedin, offers some answers to those questions that may be of value to those who plan the main activities of regular meetings.

Model kitchens being demonstrated to pupils of a country school.

IN deciding what is to be done at meetings programme planners must continue to bear in mind the ultimate aims toward which they are working, for poorly-planned and poorly-carried out activities may serve only to bore those who have to endure them. One of the arts of community living is to see that each activity is carried out in such a way that it serves as many good ends as possible.

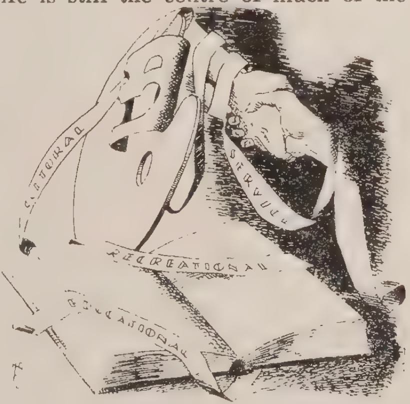
The aims of the topics suggested will not always be explicitly mentioned, though often they will be implicit in the ideas given for methods of treatment. But the suggestions will be by no means conclusive, and planners using any of the ideas given should work out in their own groups the fullest implications possible.

Selection of Topics

There are two aspects of group life: First the social and, second, the educational, cultural, recreational, and service. These are the two main purposes of most rural women's organisations and both should be provided for in the programme for each meeting.

All of women's interests centre round the home and garden and then spread through the community. Any topics coming under one or more of these headings is suitable for inclusion as the basis of the main activity of a meeting.

Little need be said about topics under the heading home and garden; ideas in this field will suggest themselves at once. Even to groups of girls who have not yet homes of their own such topics are still of interest. The emphasis may be more on the contribution of the grown-up daughter to the home life than on that of the mother, but home life is still the centre of much of the rural young woman's activity, even if her work takes her away from home during the day.



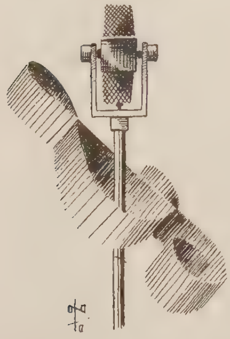
But no woman's interests should stop at her garden fence. If they do, it is high time she joined a women's group and learnt something of the implications of living in a community.

Frequently little enough is known of the activities of others in the immediate neighbourhood, of the work that is done in the village nearby to meet the needs of local farmers, their farms, and their families. The county engineer, the borough clerk, the schoolteacher, the district nurse—all could tell much about their work that would be of interest and value to those among whom and for whom they do that work.

Then there are the people who live in an environment quite different from that in the country—people who work in factories, shops, or offices, in small private firms, in large Government Departments, in transport industries, in schools and hospitals; the list can go on to those beyond New Zealand and from people to things and from things to ideas. What of science — the way the world works—and applied science—how the things in the world have been put to work for the good of the people in the world? What of history—the study of how our forbears lived—and economics—the study of how to use resources to the best advantage of everyone today? What of language—without which people could neither formulate ideas nor pass them on—and literature—the art of expressing ideas in language that is beautiful? What of music, drama, and dancing—the practical arts, which create such an excellent pattern for other types of community co-operation?

Methods of Approach

To ensure a varied and interesting approach to the selected topics it is first essential to obtain the services of good speakers and demonstrators, not mediocre ones. If the group belongs to a nation-wide organisation,



making contacts with the best people is much easier. Should the group be an isolated one, it is still worth the committee's while to spend time and trouble to obtain good speakers. The effort is always warranted by the result—that the members are "put in touch with the best thought and work on the practical and cultural sides of life, and may be equipped with that exact information which is the condition of intelligent citizenship about questions of public interest they wish to study." (1)

Second, a variety of methods must be used—not only talks and demonstrations, during which members merely look or listen, but also some of the other activities in which members themselves take part. To include something to see, something to hear, and something to do is a useful guide to programme planners.

Talks and Demonstrations

Quality has already been stressed. Though Mrs. Jones over the way may be "good at fancywork," if she has no sense of colour and no constructive ideas on good design for her needlework, she should not be asked to demonstrate. Rather should she be tactfully encouraged to attend a demonstration given by a needlewoman who is both an expert and an artist and who as a matter of course uses good colours and designs as well as good materials and stitchery.

A talk can fall on almost deaf ears if the listeners have not been prepared beforehand for the particular topic, and frequently its ultimate result will be nil unless it is followed up by some form of members' activity in relation to it. The committee should see to it that when a particularly worth-while topic is to be the subject at a meeting it is brought up in some way at the previous meeting and members are given an opportunity to think a little about it. They will then be far more ready to listen attentively and to some purpose, as their interest will be aroused already and they will be aware of some of the questions concerned. Should any particular points about which members would like further information be raised at this preliminary discussion, the secretary could well mention them when writing her letter of reminder to the speaker.

After the address or demonstration the subject should not be dropped at once. A carefully-planned exhibition, competition, roll-call, or debate may give members an opportunity to practise a craft demonstrated or contribute to some worth-while subject from their own experiences or needs. Thus learning may be interpreted and fulfilled through activity. Here are some examples:—

Before: Roll-call, "Something my Children have Taught me." Talk: "Nursery Schools." After: Exhibition of toys planned to educate in some way the child using them.

Before: Questions from members on "What I should like to Know about the Government and why" (questions to be read out and later handed to the secretary for sorting and sending to the speaker). Talk: "Parliament and how it Works" (by a Member of Parliament or other well-informed person). After: Roll-call, "Faults in Parliament that are also Recognisable in my own Home."

Before: Selected members to read aloud poems about gardens and gardening. Demonstration or talk: A gardening subject such as rose pruning, grafting, or making a compost heap. After: Display of flowers or vegetables from members' gardens.

Members' Activities

Guest speakers to deal with a subject are not always necessary. Members can often contribute quite adequately to this educational part of the meeting, and such contributions are very valuable. Sharing of experiences and knowledge of skill is one of the principles on which group life is built.

A further value is in the opportunity frequently given members to think through together problems of common interest, and to crystallise and express their thoughts. It is amazing how having to put things into words that are coherent and make sense to the listeners clarifies the thoughts behind the words so that they too make sense and may be of value to their speaker. So talks, debates, and discussions, as well as demonstrations by members, should all have their places.

Roll-calls

Roll-calls usually come into the social part of the programme, but with a suitable subject and sufficient preparation they can act as the main educational part of the meeting, in which case the programme need not provide for an active social period as well. The president should draw attention to the topic of the roll-call at the previous meeting, so that all members will come with their contributions prepared.

Some topics that can be treated in this way and not just as a contribution to the social period are:—

Recipes (members should be given time to write down each recipe).

Practical ways of teaching children good citizenship.

What character out of a book I should like to be, and why.

What annual flowers I grow best and how I do it.

How I propose to protect my children's health this winter.

What I am doing to help my neighbours overseas in Europe, or in Asia, in their present difficulties.

Short Talks by Members

Many members have little pieces of interesting information which they are willing to pass on in a five-minute talk, though they would be frightened by the very idea of giving a lecture which might last half an hour. Such short talks can be a regular feature of the meetings, immediately following the business or coming at the close of the social period. For instance, the "golden thread" or topic running through all meetings of the year used by some groups can be treated in this way, a different member saying something about some aspect of the topic each month. Subjects for short talks might be good films to come, what to do when fat catches fire in the oven or on the stove, garden hints for the month, or experiences on a holiday.

Alternatively, a small number of members may give a composite talk, each speaking on one aspect of a subject which has been carefully chosen because it has several aspects. Examples are:—

Work I used to do—as an exchange clerk, in a factory, in an office, in a shop, as a V.A.D. during the war.

Our district or village—native trees to be found here; what it was like when my grandfather lived here; what I think it will be like in another 100 years; what we can do now to improve it; some interesting people who have lived here.

Our school—my school days; what my children learn about that I did not; how we can help the school; ways of co-operating with the teacher for the good of the children; ideas for the school lunch; what we are doing ourselves for our children's education.

Such composite talks could occupy nearly the whole of the main portion of the programme and could be followed by general discussion.

Discussions and Debates

As experience is gained in speaking, members may feel prepared to attempt a debate. However, it would be a good idea to precede this with a lecture on debating, which should include ideas on the simpler group discussion or group debate as well as instructions for formal debating.

To be successful a formal debate needs to be conducted by members who can think quickly and clearly and can speak fluently and without embarrassment. It is, in fact, an art not learnt without practice. The group discussion or debate is an excellent way of getting this practice.

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1. "Women's Institute Programmes," National Federation of Women's Institutes, London, June, 1937.

Demonstrations by Members

Members frequently find showing others how to do something useful easier than talking about it. The demonstration table should be placed so that all members can see clearly what is going on. The demonstrator should plan just what she is going to do and bring with her all she will need. At first, at least, she would be wise to practise at home and list all her requirements as she discovers them.

Subjects may vary widely, depending on the particular skills of the members, but here are a few suggestions: Interesting salads, tying up parcels, repairing pockets, folding garments for packing, arranging flowers, and making embroidery designs.

Composite demonstrations give several members the opportunity to pass on their skill. They should be arranged like composite talks, so that each demonstrator deals with a different aspect of the one general subject.

Examples of subjects are:—

Book binding—binding a single-section book; binding loose papers into a cover, binding a paper-covered book in a stiff cover; repairing and rebinding a bigger book; lettering and labelling; cover designs.

Thrift ideas for the home—using feathers; making and using a hay-box; uses for old hot-water bottles; half-soling shoes with stick-on rubber soles; repairing taps, carpets, upholstered furniture, etc.

Such composite demonstrations might occasionally take more than one meeting, though that should not be usual. That on book binding might well be divided up, however, the last two sections being sufficiently different to be taken on another day.

Exhibitions

Small, straightforward exhibitions are best used as part of the social period; bigger ones to be the main educational part of the meeting must be well planned, well arranged and labelled, and clearly explained. After each exhibit has been shown and talked about, time should be given for members to look more closely at them and to ask questions.

Members bringing the articles for display must know enough about their exhibits to be able to interest others in them. If the type of exhibit does not warrant its owner's spending some minutes talking about it, it should be included not in this type of exhibition but in the smaller type suitable for the social period. Someone should be appointed to take charge of the exhibition and arrange or stage the exhibits so that not only is each displayed to the best advantage, but also the whole exhibition presents a pleasing and unified appearance. There is quite an art in this, which cannot be achieved automatically and without thought. Each exhibit should be clearly labelled, and the writing on the label should not be too small to be read at a distance of a yard or two. If all the labels are printed by someone with a little skill in lettering, the appearance of the whole exhibition is much improved.

Sometimes an exhibition can be borrowed from, for example, the Department of Health, the Plunket Society, or a city museum. In such a case, unless it is fully labelled and self-explanatory, or a speaker comes with the exhibition, a member should study it beforehand so that she may tell the others about the exhibits. Merely to have articles exhibited without explanation is of little educational or other value to the meeting.

Here are some suggestions for exhibitions:—

A particular craft, showing different stages, a craftswoman to explain each stage.

Different ways of dealing with one fruit—for example, tomatoes bottled whole, pulped and bottled, the juice extracted and bottled, chutney (with ripe or green tomatoes), green tomato jam, tomato relish, and stages in preservation methods. Such an exhibition is often possible when no facilities or equipment are available for demonstrations. If members can be persuaded to bring along some failures, a discussion of the possible reasons for them may be valuable to everyone.

Exhibition of work done by members or their families. The value of this is enhanced if a competent judge is asked to comment on the articles. It is a good way of displaying work done in a craft or cooking class held in the district, and rouses a valuable interest among members when recruiting for a new class.

Competitions

Competitions can be used more often as complementary to a previous talk or demonstration than by themselves to form the whole educational part of a meeting, for which the kind of competition chosen must give the judge ample opportunity for giving a constructive, critical talk after judging. The judge's comments must hold an important place in the meeting. Examples of competitions are:—

A bowl of spring flowers, to be judged on blooms, freedom from disease, and arrangement.

An embroidered article of original design, to be judged on suitability of material and design to the purpose of the article, workmanship, and design.

The best-packed box of flowers (to be sent to a hospital).

Three ways of serving one fruit or one vegetable (with recipes), to be judged on retention of nutritive value, ease of preparation, and general appearance.

A packed dinner for a husband to take out to the fields, judged on nutritive value, interest, appearance, and ease of preparation.

A letter overseas about the group (these could all be read out anonymously and judged by popular vote).

Exact conditions must be included with each topic. It is important that they should be thought out when the programme is planned and all details included on the printed programme, if there is one, and if not, read out clearly at the previous meeting so that members may write them down. Nothing deters people from entering a competition more than lack of exact details about what is required.

A visiting speaker is not necessarily fitted to judge and should not automatically be asked to do so. Especially if the competition and judge's comments are to take up the whole central part of the meeting, it is necessary that the judge be well qualified to act and prepared to make a critical comment on the entries.

Members' Part in Planning

Even though the final arranging and drafting of a programme must necessarily be in the hands of a few, the importance of every member feeling responsible for making some suggestions for next year's programme cannot be overstressed.

A good plan is to remind members frequently about their responsibility in this matter so that they may contribute ideas at every meeting—useful teaching about every-day things about which they want to know more, pleasant occupations for the social half-hour, projects for community service which the group may take up, ways of making the business of self-government fascinating rather than boring, new ways of drawing on the talent of the members. The interest of all members in the continued life and activity of the group is enlisted and retained when they see the programme as an embodiment of their own ideas, something they have thought up and created, an expression of their own interests, the fulfilment of their own desires. In such a case the group will truly deserve the motto: "Work of Each for Weal of All."

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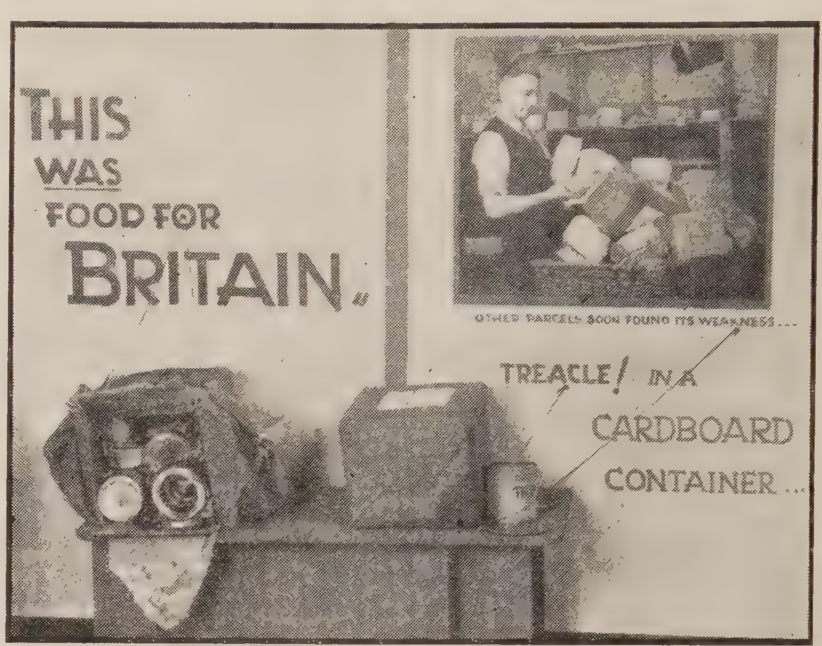
FOOD PARCELS FOR BRITAIN MUST BE PACKED CAREFULLY

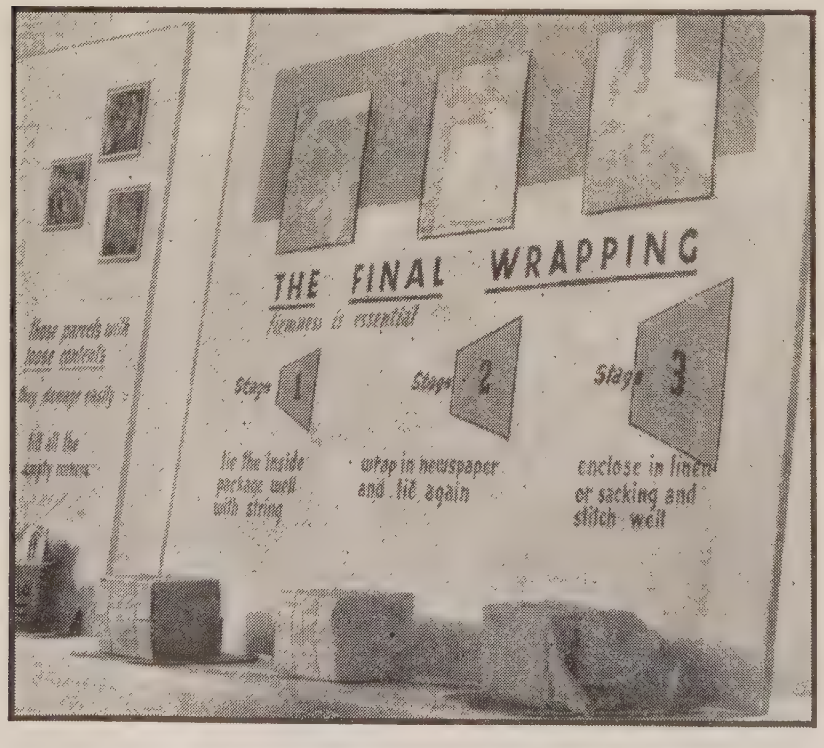
THE most emphatic evidence of the need to exercise care in the packing of a food parcel for Britain is the silent witness of a broken and damaged package. A striking example of such a parcel was on display in Wellington recently at an exhibition arranged by the Wellington Junior Chamber of Commerce in conjunction with the Post and Telegraph Department.


THIS
WAS
FOOD FOR
BRITAIN
OTHER PARCELS SOON FOUND ITS WEAKNESS . . .
TREACLE! IN A
CARDBOARD
CONTAINER . . .

THE display was designed to assist people to ensure that the parcels sent to Britain arrived in good condition. Clearly-worded posters showed how best to avoid the risk of a package failing to withstand the stresses of transit and handling. At the back of the package referred to was the telling inscription: "This was food for Britain. Treacle in a cardboard container."

Letters received from recipients of parcels formed part of the exhibition. A sender who showed care in packing received this comment in a letter: "I have received your gift parcel quite safely, and appreciate the gift very much indeed, and send my thanks to the New Zealand Post Office for it. . . ."

In contrast are the following extracts from a letter over the signature of the Chief Postmaster, Mr. E. J. Smith: "I wish to tell you that the parcel you posted recently to ——, Scotland, which contained honey, was noticed to be in a damaged condition when it was received in the Overseas Mails Branch of this office. The honey was leaking from its container, through the other contents of your parcel, and from the wrapping of the parcel. . . . Parcels in handling and in transit are subjected to pressure, and there is a definite need to take every care and precaution in packing them. If your parcel is received in a damaged condition, it will cause disappointment to the person to whom you sent it. It will also, if inadequately packed, be a source of possible damage to other parcels during transit. . . ."


These parcels with loose contents
they damage easily
fill all the empty corners
THE FINAL WRAPPING
firmness is essential
Stage 1
tie the inside package well with string
Stage 2
wrap in newspaper and tie again
Stage 3
enclose in linen or sacking and stitch well

To save senders of food parcels the disappointment of missing the mail by having packages returned for repacking, practical advice was set out in poster form. One of the chief enemies to the safe transit of parcels was shown to be pressure. Parcels must be so prepared for posting that they will withstand handling, bagging, stacking, loading, and shipping.

Stress was laid on the fact that firmness was essential. The inside package, preferably of cardboard, should be tied with string, then wrapped in newspaper and tied again, and finally enclosed in linen or sacking and securely stitched. Awkward corners should be avoided and, in the case of parcels with loose contents, the empty corners should be filled out. It was recommended that tins be used as containers within the parcels and that the lids of these be firmly soldered.

In putting the last touches to the parcel after it was wrapped the following points were set out in another effective poster: Address the parcel clearly; don't forget the sender's address; as stamps do not stick well on cloth, use a label; and don't forget to fill in the Customs declaration.

Such keen public interest was aroused by the exhibition in Wellington that the possibilities of making the display available to other centres are being investigated.

Bathroom Design in the Modern Home

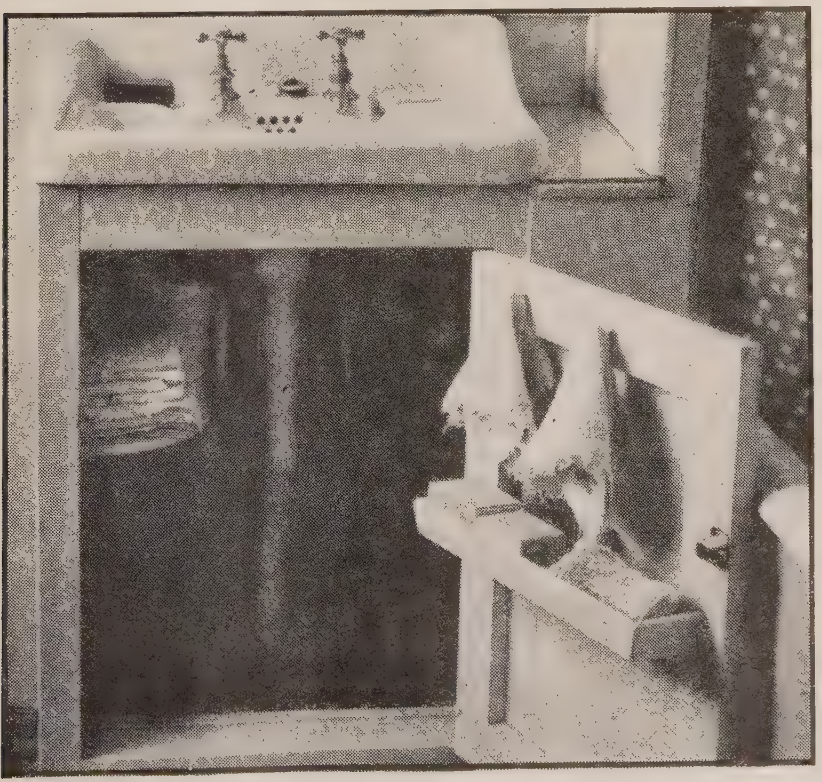
THE bathroom is the most highly-specialised room of a house and was the last to evolve as a separate room. The modern bathroom had to wait for the invention of hot water services, glazed pipes for drainage, metal pipes for carrying water, porcelain and enamel for fittings, and the development of a public opinion which regards frequent bathing as a necessity for health and not as a highly-dangerous practice. In this article Norma K. Metson, Rural Sociologist, Wellington, gives advice on the location, equipment, furnishing, and modernising of bathrooms.

A useful drawer fitted under a built-in bath.

IN New Zealand the "bathroom" is a room equipped with bath and handbasin, the water closet usually being in a separate compartment. Two factors will influence its location—ease of access and economy of plumbing. Economy requires that all rooms with plumbing and drainage (kitchen, laundry, and bathroom) should be close together with fixtures back to back or in a straight line along one wall, which means having the bathroom near or, in a two-storey house, directly above the kitchen. However, that may not be the most convenient place for use, as bedrooms and bathroom comprise the functional unit, and in a farmhouse it is also essential to have the water closet and washing facilities easily accessible from outside the house.

For small households, where little labour outside the family is employed, it is possible to arrange the bathroom near the back entrance—for example, opening off the back porch, or with two doors, one leading from the washhouse or back passage, the other from inside the house. In this way the necessary facilities are accessible without the need for extra fittings. If the household is large, or several men are employed, it is much more desirable to have separate provision for cleaning up—on the back porch, in the washhouse, or in a separate washroom.

Answers to questions in the Department of Agriculture's housing survey showed that a separate washroom was not considered a necessity by the majority, but was regarded as very important where labour was employed. In some cases it might be even more convenient to have such a room attached to the farm buildings. At the cowshed, for example, hot water is available, and a room with facilities for cleaning up and changing could be incorporated in the design of the building.



A cupboard built in under a washbasin.

Space and Equipment

Of the limited number of houses so far covered in the survey, 89 per cent. had one bathroom, 1.4 per cent. two bathrooms, and 9.6 per cent. no separate bathroom. Most of the last group had a bath in the washhouse, an arrangement which is common where space is limited and hot water must be heated in the copper because of the absence of a hot water service. A space 5ft. x 5ft. 6in. will contain a bath and handbasin; one 6ft. 6in. x 5ft. 6in. can include a lavatory as well. If a shower is used instead of a bath, the three fittings could be put in a minimum space of 5ft. square. For a family a larger room is preferable, allowing space for storage and for the mother to attend to the children, and, if it fits in better with the remainder of the house plan, the room can be long and narrow or even irregular in shape. A separate compartment for the water closet should be 5ft. x 3ft. As a powder room for guests, for a downstairs toilet in a two-storey house, or for the back washroom a space 4½ft. x 5ft. is adequate for a water closet and hand basin.

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PROVED EFFECTIVE
by independent N.Z. Scientist *

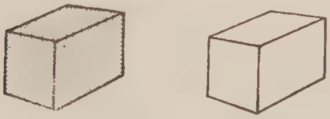
* See "Tests with Timber Preservatives in New Zealand." By J. M. Kelsey — The N.Z. Journal of Science and Technology, Vol. 27, May, 1946, P. 446. Write to Boracure for reprint.

Once again science justifies the use of Boracure. In tests of various wood-treating preparations entomologists of the Department of Scientific and Industrial Research demonstrated that Boracure's oil-soluble toxic (Pentachlorphenol) was entirely effective in the control of wood-boring insects. The tests covered several years' investigations, and Pentachlorphenol came through with flying colours. For instance

EGG LAYING TESTS
WITH PENTACHLORPHENOL

Pentachlorphenol treated blocks had NO EGGS laid on them in any tests and beetles themselves died in a shorter time than when in the presence of water soluble test specimens.

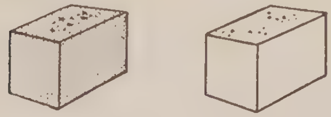
Even untreated control blocks had no eggs laid on them when used in tests near pentachlorphenol-treated blocks.



WITH WATER SOLUBLES

Eggs were laid almost as freely on blocks treated with water soluble toxics as on untreated control blocks alongside. Beetles did not die, eggs hatched and grubs lived for a considerable time.

Placing untreated control blocks alongside those treated with water solubles did not prevent profuse egg laying on controls during tests.



Pentachlorphenol proved to be extremely toxic to Borer insects, which died without laying eggs—even on untreated timber in the same cage!

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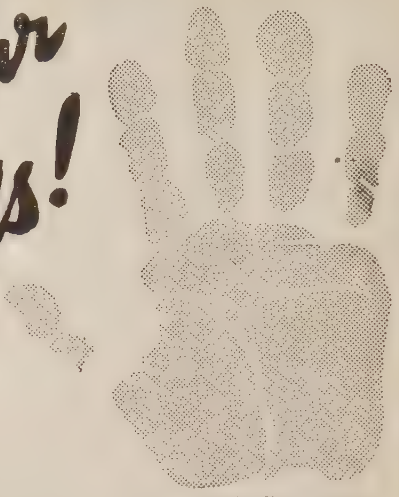
Wash your Hands!



The fingers and hands are constantly touching the hair, nose, mouth, handkerchief; body discharges and wastes; dirty dishes and eating utensils; cups and glasses; babies' soiled napkins, etc., and they may become contaminated with disease germs of respiratory or intestinal origin, such as influenza and comman colds, tuberculosis, summer diarrhoea, dysentery, typhoid fever.

The hands can place these disease germs in food, or on dishes, cutlery, and utensils. Hands must be kept scrupulously clean. Frequent washing is essential for all food handlers, particularly after each visit to the lavatory. Always wash hands before touching food or dishes; if you have to cover a cough or sneeze or blow your nose, again wash hands before handling food.

Employers of food-handlers must provide adequate, convenient and attractive lavatory facilities, including hot and cold water, soap, and individual clean towels. Then employees can protect their own health as well as that of customers.

FOR HEALTH'S SAKE
KEEP FOOD SAFE!

(This is the SECOND of a series of advertisements issued by the Department of Health in the interests of safe and clean food handling.)

FH2

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from the finest of fleece

Onehunga

BLANKETS AND WOOLLENS WITH A PEDIGREE

WHOLESALE DISTRIBUTORS—SARGOOD, SON & EWEN LTD.

Showers are widely popular, especially with children, and can be installed over the bath or, more expensively, in a separate cubicle or room. If the bath is recessed, a hinged panel of glass or plastic which folds back against the wall when not in use is most convenient to enclose the shower; it is much more efficient and less fussy than curtains. For shower cubicles an entrance barrier high enough to prevent water splashing over and out and a rack inside for soap are two small but important points in design. Types of sprays vary and may be fixed so that the water comes down straight or at an angle. Height can also be varied according to personal preference. A shower installed so that it can be used before entering the house by people who have been working outside is a boon to the housewife.

Slightly unorthodox arrangements which add to expense, but may be worth it in added convenience, are two washbasins in the bathroom, a washbasin in one or more bedrooms, a larger bathroom designed for use as a dressing room as well, or, most luxurious, bathrooms "en suite" with the bedrooms—one for parents, one for children, and one for guests.

Built-in Fittings and Storage

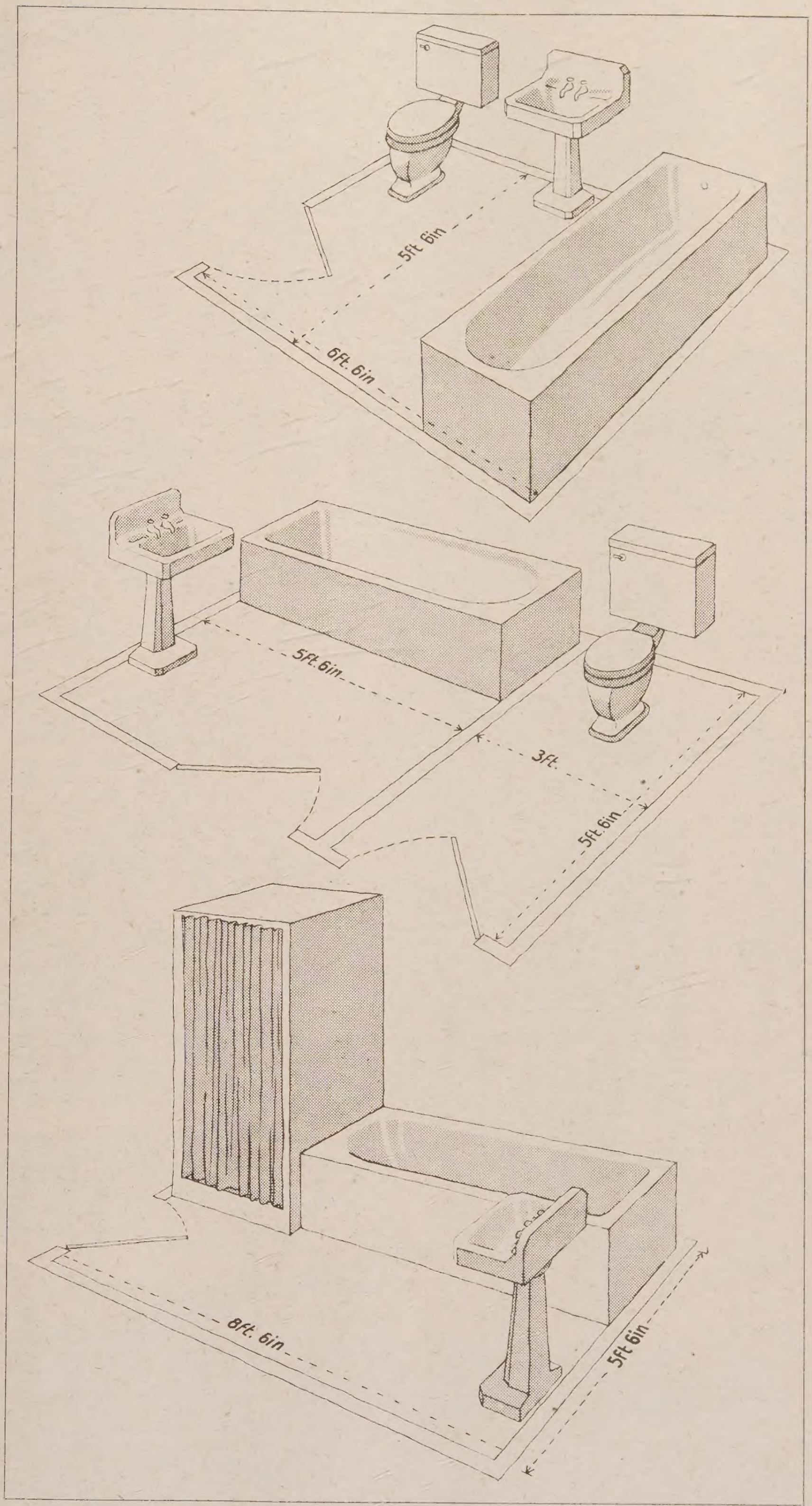
The modern trend is toward streamlining. Baths no longer stand on 6in. legs with hard-to-clean spaces beneath and behind, but are built in neatly, frequently fitting across the complete length or width of the room. If there is a space between the end of the bath and the wall, it can be enclosed to form a small cupboard, locker, or seat level with the bath. A wider space is suitable for a full-length cupboard, and a large cupboard of this kind is very useful in the bathroom. The bottom section can be used for bags or hampers for soiled clothes and linen, and shelves in the upper section will hold stocks of soap and toilet supplies, equipment for home nursing, or clean towels. As steam is inevitable in a bathroom, such a cupboard needs a tightly-fitting door and frequent airing. Watch should be kept to make sure that articles are not becoming damp.

The basin is frequently built in, too, and a cupboard below can hold bath-cleaning equipment and those at the side clean towels or toilet articles; the counter surfaces at each side are convenient for putting things on and will probably save breakages which often occur when bottles and jars are perched precariously round the sides of the basin.

Most of the other articles stored in the bathroom—shaving gear, make up, toothbrushes, medicines—are small and fit neatly into shelves or cupboards recessed into the thickness of the wall between studs. Two of these small cupboards are a good idea—one for toilet needs, the other (preferably with a lock and out of reach of children) for medicines and the first-aid kit.

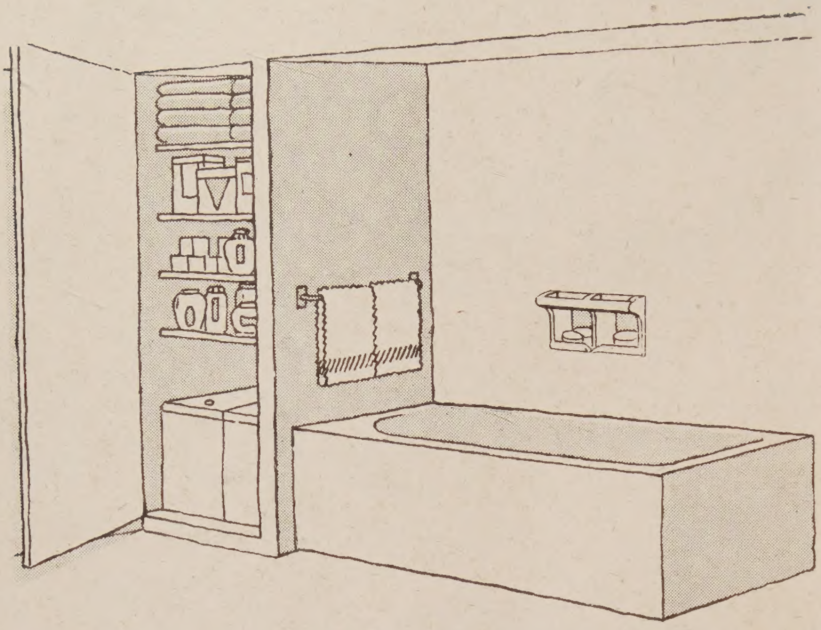
A niche can be built in beside the bath for soap and nailbrush, or a rack can be attached. A sufficient length of towel rack on which the towel of each member of the family has its appointed place will do more than anything else to keep the bathroom tidy; allow 1ft.

SUGGESTED LAYOUTS FOR BATHROOMS

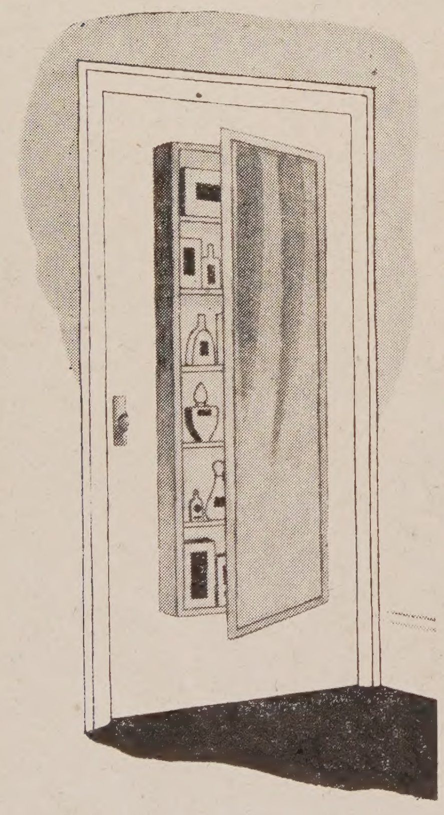


Upper—Bath, washbasin, and lavatory in a minimum of space. Middle—The standard type of layout with a separate lavatory. Lower—Dimensions for a bathroom including separate shower compartment.

DETAILS OF BATHROOM DESIGN



If there is sufficient space at the end of the bath, a full-length cupboard can be built in.



Valuable additional storage space can be provided by a shallow cupboard built on to the back of the bathroom door.

to 1ft. 6in. for each person. Heated towel rails are not beyond the reach of the ingenious, but are unlikely to become standard equipment.

Mirrors and Lighting

Good lighting is necessary in the bathroom, and a wall bracket above the mirror is the most suitable type of light. Natural light from the window is most effective if it strikes the mirror from the side. The window may be of special opaque glass or of ordinary glass obscured with a frosting mixture. If curtains are desired, sheet plastic materials are very suitable. They can be obtained in attractive patterns and colours, are not affected by steam and splashes, and are easily kept clean. Avoid a window on the wall above the bath; it is too difficult to reach for opening and closing.

The mirror should be above or near the basin, and of a reasonable size (say 12in. x 18in.) so that family members of different heights can all use it. Bathroom cupboards are sometimes designed with a mirror on the door, inside or outside.

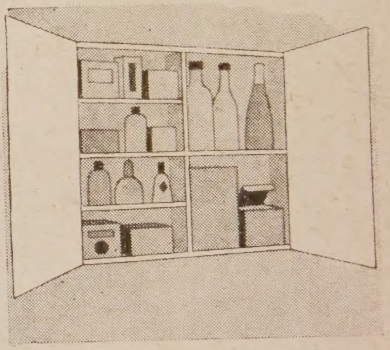
Finishes and Colour Schemes

Marble and tiles belong to a past era, and glass bricks and plastic surfaces are mostly still in the future. For every-day use a good-quality hard enamel is excellent for walls and linoleum for the floor of a bathroom. Pastel colours are generally preferred, and fittings in pink, green, and primrose are sometimes obtainable, so that a colour scheme based on these may be used. With the standard white bath and basin, walls may be kept white and the room brightened by patterned linoleum, curtains, and gay towels when they are obtainable again. However, many people feel that a predominantly-white room is too cold, and the white fittings will be found to blend quite inconspicuously into any colour scheme which may be chosen.

Avoiding Accidents

Many of the worst home accidents occur in the bathroom, and certain points in planning can help to prevent them. First is a firm handrail attached to the wall above the bath; second, a rack, dish, or wall niche for the soap; third, a bathmat, so that the floor does not become wet and slippery; fourth, a chair, built-in seat, or substantial stool; fifth, no floor mats unless they are firmly fastened or non-slip, and a floor not too highly polished. Three or four hooks on the wall or the back of the door are needed for hanging clothes. The room and the passage to it should be kept clear and uncluttered.

Because of the presence of moisture and metal piping, danger from electric shock is considerable if there is any leakage of current or defect in electrical equipment. Switches for lights and wall plugs should be placed so they cannot be reached by anyone standing in the bath or with a hand on a tap; all installations and repairs should be made by a competent workman and properly insulated and earthed.



Most of the smaller items kept in a bathroom will fit neatly into cupboards recessed into the thickness of the wall between studs.

The safe way of filling the bath—cold water first, followed by the hot—is not popular, but the habit can be developed. Certainly it should be a rule that small children are not left alone while the bath has scalding water in it. Hot water is usually drawn from the central service, but independent units which can be installed over bath or basin are obtainable.

A room which is used as intensively as a family bathroom must be efficient, and attention to the points which have been mentioned will reduce the housewife's work in keeping the room tidy and lower costs of installation and maintenance.

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